

Journal of
the Asiatic Society
1838-39

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subordinate to him, concerned in its erection. The late rainy season was one of uncommon violence, and had just closed when our survey was made, and the soil far and wide was either inundated or saturated with moisture. Nothing could have more searchingly tested the strength and solidity of a newly erected edifice ; but not a crack or symptom of yielding was to be seen, externally or within, throughout the whole extent of this fabric ; and we conclude our remarks upon it with the expression of a grateful anticipation, that a lengthened durability awaits what we have represented as so pre-eminently worthy of a lasting preservation.

In conclusion, we would here recapitulate, in a few words, the opinion to which our inquiries have led regarding the three points to which reference is made in the second paragraph of our report.

As to the execution of the works, our verdict after a careful examination of all that presented itself to our view, is one of unqualified approval and commendation.

A plan of the premises with which the architect has kindly furnished the Committee, is appended ; and will render intelligible, as a glance the relative sites of the different buildings forming the subject of this report.

We have, &c.

(Signed) R. H. RATTRAY,
 „ W. CRACROFT,
 „ HENRY DEBUDE.
 „ W. R. FITZGERALD.

CALCUTTA,
 10th Nov., 1838.

ART. IV.—*Researches on the Gale and Hurricane in the Bay of Bengal on the 3rd, 4th, and 5th of June, 1839 ; being a first Memoir with reference to the Theory of the Law of Storms in India.* By HENRY PIDDINGTON.

PART I

As Colonel Reid's Book on the Law of Storms, which has attracted much of the Calcutta papers and Edinburgh Review, had much attracted my attention ; for the subject was, to me, one connected with the events of early life, and more especially with one instance of the veering of a hurricane alone I owed my safety from death, after cutting away the mainmast of a vessel which I commanded.

Hence, having some leisure when the tempest of the 2nd to the 6th of June, 1839, occurred off the Sand Heads, I was induced to take the investigation of its different phenomena, with a view to show how far they would accord with the theory of the Law.

The sources from which I had to obtain my information were the logs of fourteen vessels which arrived at Calcutta, having felt the effects of the gale or of the hurricane; the reports of the Pilot and Light vessels, kindly furnished to me, with the permission of Captain Harrington, by my worthy friend Captain Clapperton of the Bankshall; and accounts obtained from Balasore, Poree (Juggernaut), Masulipatam, and other places, in all about thirty different authorities.

These sources form the amount of what was available here; but, that the inquiry might be as complete as possible, I addressed the following letter to the President of the Calcutta Chamber of Commerce.

TO R. H. COCKERELL, ESQ.

President of the Calcutta Chamber of Commerce.

SIR,—I beg to state that I have undertaken the investigation of the course and effects of the gale of the 3rd, 4th, and 5th instant, with reference to the theory of Colonel Reid on the Law of Storms.

I have applied, personally or by letter, to most of the captains or consignees of the inward-bound vessels which were exposed to it; and with the permission of Captain Harrington, and kind assistance of Captain Clapperton, shall obtain from the Bankshall reports from the H. C. Pilot and Light vessels. My chart is already drawn, and I am only waiting for the logs and reports.

So far, I trust, we shall be able to embody all the information which can be obtained here, and perhaps furnish a valuable supplement to Col. Reid's book; but it is evident that our work will not be complete without the statements to be obtained from the logs of the homeward-bound ships from hence; which, having stood to the south-eastward on leaving their pilots, were more towards the middle of the Bay than the inward-bound ones, whose track is toward Point Palmiras.

It is therefore my intention to print the information obtained here, with a lithographed chart, and to forward it to the President of the East India and China Association, by whom it will be forwarded to Col. Reid if in London, or if absent to Mr. Babbage; to whom I am, by the kind assistance of Sir Edward Ryan, allowed to refer; and who will take up the completion of the investigation, or refer it to competent hands.

But it has occurred to me that less attention might be paid to the application of an individual than to that of a public body; and I therefore take the liberty of addressing you, Sir, as President of the Chamber of Commerce, to request that it will be pleased to direct its Secretary to write to the Chambers of Bristol and Liverpool, the East India and China Association, and the owners and commanders of the vessels in the accompanying list, praying from them their

exertions in collecting and transmitting the required information to the President of the East India and China Association. I add a draft of a letter which states what are the points on which it is desired.

'It is unnecessary for me to add that, to a naval and a commercial nation, the value and importance of a correct knowledge of the laws by which storms are governed is such, that, in the words of Sir John Herschell 'it cannot be overrated;' and this I doubt not will excuse my intruding upon you and the Chamber for your kind assistance.

'I am Sir,

'Your obedient servant,

'H. PIDDINGTON.'

CALCUTTA,
June 25th, 1839

List of Homeward-bound vessels from Calcutta, the logs of which it is desirable to obtain for the investigation at home.

| <i>Vessels' Names.</i> | <i>Commanding.</i> | <i>Left the Pilot.</i> |
|----------------------------|--------------------|------------------------|
| Ship Marian, | T. Henry, . . | 22nd May, 1839. |
| Barque Cape Packet, . . | C. Lamb. . . | 22nd „ |
| F. Ship Emma, | J. A. Bonamour, | |
| Barque Bengal, | J. Marjoram, . . | 23rd „ |
| Ship Mobile, | D. Ogilvy, . . | 23rd „ |
| Barque Lloyds, | E. Garrett, . . | 24th „ |
| Barque Renown, | D. M'Lean, . . | 24th „ |
| Ship Gloucester, | S. E. Crook, . . | 24th „ |
| Barque Gentoo, | H. Dodds, . . | 26th „ |
| Ship William Nicol, . . | J. Potter, . . | 26th „ |
| Barque Augustus, | A. J. Gordon, . . | 27th „ |
| Barque Elizabeth, | J. Deivar, . . | 29th „ |
| Barque Clydesdale, | C. Davis, . . | 29th „ |
| F. Barque Appollon, . . | Langlois, . . | 31st „ |
| Brig City of Aberdeen, . . | J. Monro, . . | 31st „ |
| Ship Frances, | J. J. Johnson, . . | 2nd June, 1839. |

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DRAFT OF A LETTER TO COMMANDERS AND OWNERS.

SIR,—I am directed by the Chamber of Calcutta to state that Mr. Piddington, of this city, has undertaken the investigation of the course and effects of the gale experienced in the Bay of Bengal between the 2nd and 6th June, 1839, with reference to Colonel Reid's theory of the Law of Storms. The immense importance of this subject to commerce and navigation it is not necessary to point out. All the information collected here will be printed and sent home with a litho-



graphed chart, but it is evident that the inquiry can only be completed by having the tracks and weather experienced by the ships homeward-bound from hence also laid down upon the chart; and I have therefore to request that as \_\_\_\_\_ of the ship \_\_\_\_\_ you will be pleased to forward, free of expense, the information requested below to A. H. De Larpent, Esq., President of the East India and China Association, by whom it will be placed in the hands of Colonel Reid, or, in his absence of Mr. Babbage, to complete the investigation begun here.

The information desired, is—

1. Copy of the ship's log from the Pilot to 15° north latitude, with any information obtainable from the journals of the captain, officers, or passengers.

2. Notes of the heights of Barometer, Thermometer, and Simpleximeter; these are very desirable.

3. Peculiar appearance and states of the weather as to clearness, heavy dark clouds, &c., as noted at the time, or from recollection.

4. Electrical or other phenomena, as remarkable lightning, water-spouts, &c. and generally the most detailed information which can be afforded, particularly from the 2nd to the 6th June, 1839. The more details the better.

Your's, &c.,

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*Secy. Calcutta Chamber of Commerce.*

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TO H. PIDDINGTON, Esq.

SIR,—I am directed by the Chamber of Commerce to acknowledge the receipt of your letter of 27th ultimo, explaining how you are engaged in tracing the course and effects of the late gale in the Bay of Bengal, to ascertain how far the phenomena observed will support the theory recently promulgated as to the Law of Storms. And I have to inform you, that the Chamber will be happy to address the East India and China Association of London, and the Chambers of Commerce of Liverpool and Bristol, to obtain the particulars required from the homeward ships to complete the interesting investigation which you have undertaken.

I am, Sir,  
Your most obedient servant,  
W. LIMOND, *Secretary.*

BENGAL CHAMBER OF COMMERCE,  
*July 1st, 1839.*

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There was no other nautical source from which information could be obtained. I made a public request, in the newspapers, for the heights of barometers at noon from the captains who had obliged me with their logs, so as to compare these with the register kept at the Surveyor General's Office, and obtain thereby, as nearly as possible, the correct barometrical state of the atmosphere during the gale; for it was evident that, if one barometer had an error above, and another below the truth, their difference would appear much greater than it really was. In only one or two instances was this request attended to.

As stated above, I found on the part of every public officer, as well as on that of the merchants and agents whom I addressed, the greatest readiness to assist me, and this was also the case with the majority of the captains of ships; some of whom seemed to take a pleasure in affording all the information they could furnish, accompanying their logs with detailed notes; but a few were sadly churlish, and had to be written to or called upon three or four times, before they could be persuaded to take the trouble of furnishing me with the extract of the four or five days' logs, which was all that was required;\* and others, still more provokingly, having given me a valuable extract, paid no attention to my repeated applications for further information on points which would evidently have been of the greatest interest. I abstain from mentioning names. But in one instance I called and wrote *seven* different times, to obtain further notes, or a sight of the ship's log book, and without success! The subject was new to some, and they were not aware of its importance. "I don't think they will make much of it" was the remark of more than one; until what *had* been "made" of it was explained to them. Unfortunately indisposition prevented me latterly from going on board of the few vessels which have thus escaped me. There is, it is true, some excuse for men so hurried and vexed as commanders of ships, having to discharge and re-load in Calcutta, often are; but I trust on a future occasion that, as I shall elsewhere suggest, authority will be given to the Master Attendant to compel the fulfilment of this public duty; so exceedingly trifling in itself from each individual, and yet so deeply important to the community at large, and indeed to the very individuals from whom it is required, did they rightly understand their own interests.

It will be necessary first to place upon record the materials, before proceeding to the deductions they afford; but to do this within a more

\* The answer to my second or third hint in one instance is worth inserting.

"MR. PIDDINGTON,

Calcutta.

"Sir,—I received your note, but I have not time to attend to such trifles. But if you call on board the ship, in all probability the Mate will allow you to see it." —

convenient compass, and to the landsman in a more readable shape, I have, when the captains of vessels themselves have not given me a summary, made one from the logs, comprising all that is essential to our purpose. The seaman will, I hope, be satisfied when I say that I have commanded a vessel, and have therefore I trust omitted nothing of consequence. The logs themselves will be sent to Europe for the use of Mr. Babbage or Col. Reid.

No. 1.—*In Calcutta.*

The Meteorological registers from the Surveyor General's Office—the notes on the weather I have added as it appeared within the town.

| 1839.    | Bar. at Noon. | Ther. | Winds.      |                                           |
|----------|---------------|-------|-------------|-------------------------------------------|
| June 1st | 29.536        | 92.7  | NE. Cumuli, | { Squalls from the NE. with rain.         |
| 2        | „ 475         | 90.8  | EbS. Cum.   | { Strong squalls and rain.                |
| 3        | „ 428         | 89.10 | .....       | { Fresh gales with squalls.               |
| 4        | „ 400         | 86.7  | EbN. ....   | { A gale with very severe squalls & rain. |
| 5        | No Registers. |       | ESE. ....   | { Strong squalls veering to SE            |

No. 2.—*Diamond Harbour. Latitude 22° 11'.*

On the 1st June, Light variable airs. 2nd, Variable, cloudy, and frequent rain. 3rd, NE. breezes and rain. 4th, Strong NNE. breezes and frequent rain. 5th, Strong gales and squally East to SSE. and heavy rain. 6th, Wind at SSE. and cloudy. Thermometer from 1st to 6th 83° to 85°.

No. 3.—*Kedgeree. Latitude 21° 52' north.*

June 1st.—Light variable Easterly winds, cloudy, and rain, thunder, and lightning. 2nd, Cloudy, N. Easterly squalls and rain with calms, heavy rain, thunder and lightning. 3rd, Heavy squalls from North to East and rain, very unsettled appearance. 4th, Heavy Easterly squalls and rain, unsettled weather. 5th, Smart gale from SE. to E. and rain. 6th, Strong breezes, SE. to S. and cloudy.

No. 4.—*Hon'ble Company's Upper Light Vessel "Hope," A. C. Hudson, in Latitude 21° 26' north.*

*1st June, Civil Time.*—Winds light and variable all round, with some rain. *2nd,* Light winds during the first part; at noon heavy squalls from the East, with rain and thunder; latter squally, with wind from the Northward at times. *3rd,* First part variable and squally from E. to N.; in the morning, wind increasing from NE. with heavy squalls; noon wind ESE. inclining to a gale; at sunset gale from E., and during the night from ENE. with heavy sea; vessel riding with 160 fathoms cable. *4th,* Gale continuing in heavy gusts from Eastward and shipping seas fore and aft. Till noon the same weather, but wind at ESE.; at 8 p. m. gale veering to SE. with dull gloomy weather, and at midnight gale at SSE. *5th,* To day-light gale blowing very hard at SSE. veering latterly to S. in heavy squalls, with dismal weather and a heavy sea on; vessel shipping water fore and aft; at noon gale decreasing, with rain at sunset. Toward midnight strong breezes at S. with very heavy sea.

I shall in another part of this paper refer to the very instructive barometrical observations annexed to this log, which are highly creditable to Mr. Hudson's attention.

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No. 5.—*Hon'ble Company's Lower Light Vessel "Beacon," Latitude 21° Longitude 88° 27'—J. Davenport, Commander.*

1st June, Civil Time.—A. m. light winds E. to NE with heavy clouds to the SW., middle and latter parts moderate breezes, NE. to ENE. cloudy, unsettled weather and a heavy swell.

2nd.—Mostly moderate ENE. breezes, with cloudy unsettled weather, and a heavy sea rising; at midnight blowing strong; heavy squalls from ENE. with rain, thunder and lightning.

3rd.—Wind mostly from ENE. veering latterly to E. in the squalls. A. m. blowing hard, and increasing latterly to a gale, with a heavy sea; vessel shipping water fore and aft. *4th,* Gale veering from ENE. to E. and ESE. with severe squalls and a heavy sea; every appearance of a heavy gale; middle and latter parts blowing a gale SSE. to ESE. with heavy squalls of wind and rain; a heavy sea, and dark, dismal, threatening appearance all round. Kept the whole of the crew on deck during the night; riding with 200 fathoms of cable. *5th,* Gale moderating, but still blowing heavy and in hard squalls from SSE. to SE. with a heavy sea; latterly wind from SSE. to S. blowing hard and in squalls, with dark passing clouds and heavy sea;

vessel rolling and pitching very much, riding with 200 fathoms of cable. 6th, Strong southerly breezes and squally.

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No. 6.—*H. C. Pilot Vessel "Jane."*\*

1st June, 1839. *Civil Time*.—On the cruising station off Point Palmiras, winds light and variable, cloudy to the North and Eastward. 2d June, Throughout fresh breezes and squalls with rain from the Northward, and threatening appearance to the Eastward, anchored near the Floating Light Beacon. A strong current to the Westward. 3rd June, Throughout strong gales with rain and very threatening appearance to the NE. 4 A. M. Fresh gales from NE. Noon, gale increasing; riding with 170 fathoms cable. 4th June, Throughout hard gales E. to ESE. with heavy rain and threatening appearance all round; noon, blowing hard from E. to ESE. wind SE. in squalls with heavy rain and threatening appearance. Vessel driving, let go a second anchor. 5th, Strong gales from SE. to S. heavy rain and threatening weather, latterly squally from SSE. to S. 6th, Moderate breezes from South.

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No. 7.—*H. C. Cruizer "Amherst," J. Paterson, Esq. Commander.*

Memorandum of the state of the winds and weather from the 29th May to the 6th of June at the head of the Bay of Bengal, as experienced on board the H. C. Ship "Amherst" on her voyage from Arracan to Calcutta, 1839.

29th. Started from Akyab at day-light with freshening breezes from E. to NE. and rain at intervals; the mountains covered half way down with thick white clouds; at sunset weather much clearer, the sea smooth, the wind decreasing, throughout the night very fine.

30th. The weather become perfectly clear, without rain; the same appearance in every direction; horizon interspersed with very light still clouds, light Easterly airs and calms, sea smooth, the ship going from one to three knots per hour; at 8 P. M. sharp flashes of lightning to the ENE.; the night continued fine and very clear, little variation in the wind. Long. 90° E. lat. 20° 39'.

31st. Day-light sharp lightning to the Eastward, wind increasing from that quarter; the weather began to settle down for rain at noon, variable sharp squalls from SE. to NE. with a good deal of rain,

* The European reader, into whose hands this may fall, requires perhaps to be told that the Honorable Company's Pilot vessels, at the mouth of the Hooghly, are not Pilot-boats, but fine stout Bombay-built Brigs of 250 tons, perfectly well manned and provided in all respects, and officered by able seamen duly educated to their profession.

thunder and lightning to the Eastward ; sunset, the wind steady from the Eastward, with smooth sea, occasional showers during the night, lightning very vivid to the Eastward, sometimes sharp flashes of lightning to the South.

1st Jun^e. The weather very similar to yesterday, more sea, very sharp lightning during the night to the NE. ; 8 p. m. Outer Light Vessel bearing NNE. about nine miles distant.

2nd. Heavy squalls from NE. to NNE. during the early part of the morning ; 10 a. m. wind steady from ENE. weather more hazy and sea rising ; 4 p. m. wind NE. by E., sharp lightning to the ENE. ; sunset, Outer Light Vessel SE. by E. six miles ; 8 p. m. Light Vessel E. by N. ; heavy squalls from the NE. with sharp rain, ship under double reefed topsails, the weather threatening throughout the night.

3rd. Day-light heavy squalls from the ENE. ship under double reefed topsails, sea rising fast with rain ; noon, off the tail of the Eastern Sea Reef ; gale increasing from ENE., ship standing out under three reefs in the topsails, top gallant yards on deck : at 8 p. m. split the topsails, reefed the courses, the wind steady from ENE., heavy sea and the gale still increasing with rain, no lightning up to midnight.

4th. 2 a. m. ship reduced to main courses, wind ENE. heavy gusts of winds and rain ; 4 a. m. a hard gale at ENE. ship labouring much ; 6 a. m. gale still increasing ; at 11 a. m. ship under bare poles, wind ENE. ; 3 p. m. wind E. ; 3° 30' p. m. wind ESE. ; 4 p. m. wind SSE. ; blowing a perfect hurricane ; 6 p. m. wind South, a tremendous cross sea ; ship at this time off " Codgone Point," up to midnight blowing a perfect hurricane from South to SSW. no lightning nor thunder.

5th June. 2 a. m. gale began to moderate from SSW. with heavy cross sea ; noon, longitude 87° E. latitude 20° 3' N. ; ship throughout the remainder of the day under foresail and close reefed main topsail with dry weather but very hazy, the sea very high.

6th. The wind steady from SSW. and hazy.

Remarks.—The 30th May led me to be very watchful of the weather, it became so extremely clear and such a sameness in the appearance all round ; the stars very bright, the clouds stationary and of a very light appearance, the lightning very very sharp, the noise of every thing on board seemed to be more than ordinary. What was most remarkable, the wind continued so steady from the Eastward at one time on the 4th that I had most serious apprehensions of the ship drifting on shore upon the western shores of the Bay ; the wind shifted suddenly, otherwise nothing but her anchors could have saved her.

J. PATERSON, *H. C. Ship " Amherst."*

No. 8.—H. C. Pilot Vessel “*Krishna*,” Mr. J. Crook, Branch Pilot, Commander,—at the Cruising Station.

2nd June, 1839. Civil time.—NE. to E. squall and threatening to the Eastward. 3rd June A. M. freshening fast NNE. to NNW. with dirty weather; noon fresh gale NNW. to NNE. at $20^{\circ} 10'$; weather threatening stood off the land. 4th Wind N. by E. at noon hard squalls and rain; gale increasing to 8 P. M. Midnight wind N. and gale apparently breaking. 5th A. M. Threatening again, and an increasing gale NNE. to NNW. till noon. P. M. hard gale, hove too under main topsail and fore topmast staysail, at 8 under bare poles; a man washed overboard but saved. Wind from N. to W. and SW. 1 P. M. a *dead calm*! with a high cross sea rising perpendicular, caused by a heavy roll coming up from the SW. against the northerly one; vessel labouring very much; at $1^{\circ} 30'$ P. M. wind suddenly veered round to the SW. and blew a furious gale with severe squalls and heavy rain till night. 6th A. M. gale moderating. At noon clearing up. Wind WbS.

No. 9.—2nd June, 1839.

Brig “*Sarak*” from Rangoon stood in on the evening and took a pilot on board, but the weather being suspicious stood out to seaward.

3rd June. Throughout the night hard squalls ENE. and rain. At day-light every appearance of an approaching gale, high sea, and hard squalls; noon, lat. $20^{\circ} 30' N.$ in 46 fathoms (about long $88^{\circ} 02' E.$) Strong gales ENE. and high sea; at midnight hard gale about E.; vessel struck by a sea abaft, and jolly boat carried away.

4th June A. M. constant hard squalls and gale about ESE. till noon; P. M. more moderate; at 2 P. M. wind veered to the Southward with rain; at 4 P. M. increasing gale, furled all sail, hove too under bare poles; at 9 P. M. Bar. $28^{\circ} 88'$; and to midnight hard gales veering round. Barometer $28^{\circ} 56'$.

5th June. Day-light moderating; towards noon fresh gales SSW. and clear with high sea. Lat. $19^{\circ} 42' N.$

No. 10.—Honorable Company's Pilot Vessel “*Saugor*,” Mr. J. Cearn, Branch Pilot, Commander.

2nd June, Civil time.—At anchor in nineteen fathoms, off Point Palmiras bearing about NWbW. 1 P. M. a squall from the Eastward; till midnight pleasant.

3rd June.—A. M. squalls from NE. and ENE.; at noon strong breezes and a heavy swell from SE., but wind N.; gale freshening, and at midnight from NE.

4th June.—Increasing fast from NE.; at noon NE.; 8 P. M. ENE. a hard gale at E. and heavy sea at midnight.

5th June. 4.—A. M. wind E.; noon ESE.; hard gale veering to SE. and SSE.; moderating at midnight. On 6th June A. M. wind South.

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No. 11.—*Pooree, or Juggernaut Pagoda*, 19° 48' N., 85° 45' E.

Letter from Dr. Cumberland, Surgeon of the Station, who after regretting that he can give but imperfect information, says,—

“The 2nd of June was very cloudy; about 11 A. M. we had a heavy squall from the E. afterwards a succession of others, from almost every point of the compass. At night it was blowing hard from the NE.; and on the 3rd, we had a hard gale from the N. with heavy clouds and rain. On the 4th, still blowing a hard gale from the N. with heavy clouds and incessant rain; at 5 P. M. the wind shifted suddenly to the W. and gradually veered round to the SW. after which it moderated, still however blowing a gale. On the 5th, the gale continued from the SW. very cloudy but no rain. On the 6th and 7th, fresh breezes from SW. with very cloudy weather. On the 8th, light winds. The quantity of rain which fell on the 2nd of June was 1 inch; on the 3rd, 2 inches and 1-10th; on the 4th, 4 inches and 9-10ths.

POOREE, 6th July, 1839.

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No. 12.—*Letter from Captain Hookey of the ship “Mary Somerville,”*
15th June, 1839, accompanying his log.

I have much pleasure in communicating any information in my power respecting the gales in the Bay of Bengal on the 3rd, 4th, and 5th June, in which the “Mary Somerville,” and several other vessels happened to be. Although the gale with us appears to have been of short duration, it was very severe. We experienced ever since crossing the equator, (which we did on the 20th May) hot sultry weather, with variable winds from N. to W. chiefly. On the 3rd June, at noon, latitude 19° N. longitude 85° 29', wind very unsteady, both in strength and duration, with heavy squalls chiefly from NW.; occasional heavy rain. Ther. 86°, Bar. 29° 25', Simp. 29° 40'.

4th June.—Fresh gales from W. with heavy rain; at noon Ganjam NWbW. twelve miles. Ther. 86°, Bar. 29° 15', Simp. 29° 30'. It continued to blow a fresh gale but not a severe one, wind from W. to WSW.; at this time a heavy sea from SE., ship lurching very much.

5th June.—Strong breezes; ship under double reefed topsails, wind SW.; at noon Juggernaut Pagoda NE $\frac{1}{2}$ E. eighteen miles; at 5^o 30' P. M. the Black Pagoda bore NWbW $\frac{1}{2}$ W. fifteen or sixteen miles; wind now increasing to a severe gale at S.; hove the ship too under easy sail; head from ESE. to EbN. but the wind drew gradually round to the SW.; the sea continued at SE. and the ship laboured most tremendously; at midnight it began to moderate, and blew a fresh breeze from SW. which carried us to Point Palmiras by 5 o'clock P. M. on 6th June. When the severe part of the gale commenced at 5^o 30' P. M. 5th June, the Black Pagoda bore NWbW $\frac{1}{2}$ W. sixteen miles; the Ther. was 86°, Bar. 29^o 10', Simp. 29^o 25'; the lowest we had it; and it began to rise at 10 A. M., Simp. first, then Bar. about an hour after. We must have escaped a great part of the gale as the SE. sea was very high, but we never had the wind from that quarter; the severe part with us was from SSW.

Captain Hookey says in another letter to me—the reason of our laying too so much was not caused by stress of weather, but from our having carried away our fore topmast, and fore and main topgallant masts in a severe squall from the NE. on the 2nd in the afternoon; I therefore laid too till the ship was again prepared to run for the Sand Heads ———.

No. 13.—Ship "*Justina*," Extract from her log forwarded by Capt. T. H. Bentley.

3rd June, 1839.—*Nautical time*.—Monday night at 2 A. M. squally; in royals and flying jib (ship's head NEbE. wind NNW.) in fore and mizen topgallant sails. At 5 A. M. heavy appearance to the N. reefed the driver, sent down royal yards.

At 8 A. M., ship's head NE. wind NNW., gale increasing; in 2nd reef of the topsails; at 9 A. M. heavy squalls with heavy rain; up mainsail; at 10 gale increasing, up foresail, in mizen topsail; heavy squalls with rain; at noon ship's head ENE. wind N., furled mainsail, wore ship. Lat. Obs. 19^o 14' N.

Tuesday, 4th June. Wore ship to the westward; at 1 P. M. ship's head WSW. wind NW. strong breezes and squally, close reefed the fore topsail, furled the fore sail; at 3 P. M. gale increasing, in 3rd reef of the main topsail, in driver; at 5 P. M. ship's head SWbW. wind NW. heavy cross sea running, ship pitching heavy; at 6 gale increasing fast with heavy squalls and constant rain.

At 7 ship's head SW $\frac{1}{2}$ W. wind NW.; at 9 ship's head SWbW. pitched bowsprit under, carried away the jib boom, fore topgallant

mast and main royal mast ; cut away the jib and flying jibboom ; made the fore topgallant mast fast to the topmast rigging ; at 11 hard squalls with a high sea running. At midnight ship's head SWbS. wind NW. At 2 A. M. severe gale, with a tremendous sea running ; at 3 ship's head SW. wind WbN. the fore topmast staysail blew to atoms, ship lying with the lee bulwarks under water ; at 4 heavy gales with severe squalls and constant heavy rain ; at 8 bent another fore topmast staysail ; at 9 A. M. ship's head SbE. wind WSW.) at noon hard and severe gales, the fore yard arm at times in the water.

Wednesday, 5th June. At 1 P. M. ship's head south ; wind WSW. at 3 a heavy sea filled the quarter boat, the fore davit gave way, let the boat in the water, cut away the after fall the boat being stove ; a heavy sea with severe squalls ; at 5 P. M. ship's head SbE. wind SWbW. more moderate ; at 6 wore ship to the NW. ; at 7 set fore trysail ; at 8 ship's head WNW. ; wind SWbS. ; at 11 more moderate, set the foresail ; at 1 A. M. ship's head NW., wind SW. brisk gales with passing squalls and rain ; at daylight got the fore topgallant mast and royal mast on deck ; at 8 set fore topsail ; at 9 out 3rd reef of the main topsail ; at 11 got all clear, at noon moderate and cloudy. Lat. by Obs. $18^{\circ} 15' N.$ long. by Chron. $85^{\circ} 11' E.$

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No. 14.—*Ship "Ann Lockerby," Capt. Burt.—Extract sent.*

*Tuesday, June the 4th.* In lat.  $18^{\circ} 55' N.$  and long.  $86^{\circ} 30'$  it commenced to blow heavy ; the wind from N. to NNW. the height of the barometer was  $28^{\circ} 75'$  and raining heavy ; the gale still kept increasing till the morning of the 5th at 8 A. M. when it blew a complete hurricane, the wind at NNW. and it shifted round to WSW. ; about noon the barometer was standing at  $28^{\circ} 15'$  ; the ship at that time was in lat.  $19^{\circ} 5' N.$  and long.  $87^{\circ} 6' E.$  J. BURT.

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No. 15.—*Ship "Eden," Capt. W. D. Cook.*

3rd June, Civil Time—Lat. $18^{\circ} 22' N.$ long. $86^{\circ} 1' E.$ P. M. strong winds variable WSW, to WNW. with rain. Barom. $29^{\circ} 40'.$ 4 P. M. the same ; with a heavy sea running ; wind west ; 8 P. M. increasing winds, in jib, mainsail, and mizen. Barom. $29^{\circ} 30'$ ditto weather, wind N. ; 4 A. M. strong winds and squally ; wind NWbN. ; 8 A. M. hard gales, wore ship to the southward, Barometer $29^{\circ} 10'.$ noon ditto weather, sun obscured ; wind West, under bare poles ; 4 P. M. hard gales with heavy squalls and a tremendous sea running ; wind SWbW. Barometer $29^{\circ} 00'.$ *4th June.* Midnight blowing a perfect hurricane at WSW. without intermission. Barom. $28^{\circ} 80'.$ 4 A. M. ditto weather

Barom. $28^{\circ} 70'$; 6 A. M. struck by a heavy sea which hove the ship on her beam ends, shifted a great part of the ballast, washed the man from the helm, and part of the bulwarks away. 8 A. M. ditto weather, ship labouring heavily; set a storm mizen staysail. Wind WSW. Barom. $28^{\circ} 60'$. Noon ditto winds, with continued heavy rain, Barom. $28^{\circ} 60'$; 4 P. M. gale a little abated, set the main topsail close reefed. Barom. $28^{\circ} 70'$; 8 P. M. heavy squalls with lulls at times. Midnight, more moderate; set the foresail. Barom. $28^{\circ} 80'$ 4 A. M. Out two reefs main topsail, and set the fore out double reefed; 8 A. M. set the reefed mainsail; wind SW. Barom. 29° . Noon, strong breezes and hazy with less sea. Lat. observation $18^{\circ} 1' N.$ long. Chro. $86^{\circ} 52' E.$ Barom. $29^{\circ} 25'$. June 6th. Moderate weather; got soundings under the Black Pagoda at 2 A. M.

No. 16.—*Masulipatam, 15th July, 1839.*

DEAR SIR,—I have the pleasure to send you an extract from my Journal, we had neither thunder nor lightning, but there was a very heavy sea rolling in from the Eastward.

I have not a Simpiesometer.

RICHD. ALEXANDER.

| Thermometer. | | Barometer. | | June, 1839.— <i>Masulipatam.</i> |
|--------------|------|------------|-----|-----------------------------------|
| Date. | Max. | | | Winds, &c. |
| June 1 | 87 | 29 | 700 | From WNW. fresh, dazzling rain. |
| — 2 | 88 | — | — | WNW. to SSW. do, very cloudy. |
| — 3 | 87 | — | 695 | Ditto ditto ditto, dazzling rain. |
| — 4 | 83 | — | 633 | Ditto blowing very fresh. |
| — 5 | 90 | — | 600 | Ditto ditto ditto ditto. |
| — 6 | 91 | — | 625 | Ditto to W. and SSW. very cloudy. |

No. 17.—*Extract from the log of the Brig "Nine," Captain Denny, in the Bay of Bengal, June 1839.*

Saturday, 1st June, Nautical time.—Strong gale throughout, with heavy squalls and showers of rain, wind WbS. No observation. Lat. by account $14^{\circ} 7' N.$ long. $85^{\circ} 28' E.$, Bar. $28^{\circ} 7'$, Ther. 82° .

Sunday, 2nd June.—Heavy gale throughout, with constant rain and heavy squalls, wind WbS. No observation. Lat. by account $16^{\circ} 7' N.$, long. account $85^{\circ} 52' E.$ Bar. $28^{\circ} 6'$. Ther. 83°

Monday, 3rd June.—Strong gale throughout, with heavy squalls and rain. Wind WbS. No observation. Lat. by account $17^{\circ} N.$, long. $86^{\circ} 16' E.$ Bar. $28^{\circ} 6'$. Ther. 84°

Tuesday, 4th June.—First and middle parts strong gale, latter more moderate, wind WbS. Lat. by account $17^{\circ} 36'$, long. $86^{\circ} 43'$ E.

Wednesday, 5th June.—Fresh gale throughout, with heavy squalls and showers of rain. Lat. by observation $18^{\circ} 39'$ N., long. Chro. $88^{\circ} 18'$ E.: On getting an observation, found we had a set of $60'$ to the southward during the gale; wind S. W.

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No. 18.—*The ship "Elizabeth," of Glasgow, Captain Denar; homeward bound, left the Pilot, according to her protest, on the 29th May.*

On the 2d June, in lat. about  $16^{\circ}$  N. and long.  $88^{\circ}$  E. she experienced a very severe gale from the SW. with a heavy cross sea; hove too; but the sea was washing over her continually. About midnight she was struck by a heavy sea on the quarter, which started the whole of her stern frame; she bore up with seven feet water in her hold to the NE. and on the 3rd again hove too with her head to the NW. The wind hauling to the SW. she bore up about NNW. for the Sand Heads but could only reach Laccam's channel, where the vessel was driven on shore and lost; the captain and crew reaching Calcutta in a state of great distress and exhaustion through the Sunderbunds.

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No. 19.—*Ship "Jumna," Captain Robinson.*

1st June, Nautical time.—Lat. $12^{\circ} 25'$ N. long. 85° E. dark gloomy weather, with much lightning to the NWbN. and NE. quarters, the wind freshening to a gale from W. or WSW. The barometer had been falling for several days before.

2nd June.—Lat. $15^{\circ} 20'$ N., long. $85^{\circ} 30'$ E. The gale continuing from W. with much rain.

3rd June.—Heavy gale from W. to WSW. generally; with lightning and ceaseless rain, and looking awfully dark to the NW. and N. The wind at times offering to shift in that direction, but never got further than WNW. and only remained there for a short time. Lat. $16^{\circ} 40'$ N. long. $85^{\circ} 30'$ E. at noon.

4th June.—The gale continuing, but blowing more in heavy squalls, with torrents of rain. The barometer $29^{\circ} 19'$ inches, lat. $17^{\circ} 10'$ N. long. $85^{\circ} 35'$ E.; p. m. more moderate; wind SW. fair, with hazy weather.

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No. 20.—*The Brig "Laurel Amelia" from Coringa towards Chittagong left Coringa roads, 3rd June, Nautical time, at 5 p. m. with light southerly breezes and clear weather; during the night the wind veered to West; at noon it was West, with drizzling rain and strong gales. Lat. and long. omitted in this log.*

4th June.—Westerly winds, strong gales, vessel under courses, steering Eastward. During the night increasing gale, ship labouring very much; daylight the same, and weather very threatening, with a heavy sea on; prepared every thing for bad weather; noon, hard gales. No observation. Lat. by acct.  $16^{\circ} 56'$  N. long.  $82^{\circ} 58'$  E.

5th June.—P. M. hard gales with drizzling rain, increasing at midnight to a hurricane from the Westward. Daylight, and till noon, scudding under bare poles and laboring very much. No observation; lat.  $17^{\circ} 22'$  N. long.  $83^{\circ} 44'$  E. by account.

6th June.—Towards sunset hurricane abating a little; at midnight moderating; daylight under the foresail; noon more moderate, set the topsails. No observation. Lat. by acct.  $18^{\circ} 19'$  N. long.  $84^{\circ} 29'$  E. On the 7th the weather fine.

It is clear that this vessel, being on the south side of the vortex made a fair wind of the hurricane; but the latitudes and longitudes must be wholly erroneous, since, though scudding before a hurricane from the Westward they give a NE. course made good along the shore! Captain Elson, of Chittagong, to whose politeness I am indebted for this log and that of the "Louisa" and "John William Dare," informs me that the last only is to be depended upon, as the Chittagong vessels are rarely provided with good instruments or able navigators. I have however felt myself bound to mark the track as here given, though I think it probable that on the 5th she was at least two degrees further to the Eastward, and I have therefore marked also her probable position.

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The following very interesting remarks I received on the arrival of the "Mobile" from the Mauritius. It will be recollected that this ship was one of the outward-bound; having left her pilot on the 23rd May. I regret much that no latitudes and longitudes accompanied the first letter, so that I could only mark this vessel's drift approximatively on the chart as it was going to press; for this cause too this vessel is omitted upon the diagrams of the gale.

No. 21.—*Extract from the log of the ship "Mobile," on a voyage from Calcutta to Mauritius, forwarded by Captain Ogilvy.*

For several days prior to the 2nd June the weather was for the season of the year remarkably fine, and the wind instead of SW. was veering round the compass. We had reached the latitude of 15° N. long. 84° E. in seven days from the Pilot. On the morning of the 2nd the swell increased considerably from the South, and at noon the mercury in the barometer, which had remained for some days steady at $29^{\circ} 90'$, was affected, and commenced falling fast. At this time (noon) we had a moderate breeze from the NNW. and the appearance of the

weather indicated not the slightest change. The breeze in the afternoon gradually increased, and at 4 p. m. took in one reef of topsails ; Barometer $29^{\circ} 55'$. At 6 p. m. a very heavy black cloud rose in the Eastward ; and apprehensive that a gale would come from that quarter, I altered my previous course of SSW. to SSE. in order to get more sea room. At 8 p. m. the barometer had fallen to $29^{\circ} 40'$, and the wind a fresh steady breeze from the NW. with slight showers of rain : took in 2nd reefs. 11 p. m. The breeze completely died away, and for the next seven hours it was nearly calm, the barometer stationary, and the black cloud still hanging in the Eastward, with very vivid lightning issuing from it.

At 7 a. m. 3rd June the wind sprung up again from the NW. and commenced blowing so strong that all sail was taken in, excepting the close reefed main topsail ; and the ship hove too. Noon, strong gale, with very heavy gusts of wind from the West. Bar. $29^{\circ} 40'$. Took the main topsail in, and spread a tarpaulin in the mizen rigging. 4th June do. winds and weather, with a very high sea ; by account lat. $15^{\circ} 50'$ N. longitude $84^{\circ} 40'$ E. 5th June, wind veering to SW. and producing a tremendous cross sea, the ship rolling and labouring much. Bar. $29^{\circ} 5'$. latitude by account $16^{\circ} 20'$ N. $85^{\circ} 20'$ E. p. m. The Bar. rising, and the wind veering to SSW. with more moderate weather. The sea at this time, from the altering of the wind, was running in three or four directions, with immense crested tops which threatened instant destruction ; but fortunately at this time it commenced raining heavily, which had a great effect in reducing the topping of the waves. On the 6th June, by observations latitude $17^{\circ} 10'$ N. longitude $86^{\circ} 15'$ E. Found that we had drifted to the NE. 200 miles.

D. W. OGILVY.

No. 22. Barque "*Susan*," Captain Neatby,—Nautical Time.

31st May.—Wind WbN. to WbS. Bar. p. m. $29^{\circ} 60'$; midnight, $29^{\circ} 55'$; noon $29^{\circ} 50'$, Ther. 79° . Strong gale increasing from yesterday, with violent squalls and rain every hour. Lat. noon $12^{\circ} 47'$, long. $90^{\circ} 43'$ E.

1st June.—Wind WbN. to WSW. Bar. p. m. $29^{\circ} 50'$; noon $29^{\circ} 40'$. Ther. 79° to 76° hard gale with constant heavy squalls and rain, with heavy sea, ship laboring much. At noon hard gale and heavy squalls. Lat. $14^{\circ} 2'$ N. $91^{\circ} 14'$ E.

2nd June.—Wind W $\frac{1}{2}$ S. to WSW. Bar. $29^{\circ} 40'$ to $29^{\circ} 36'$. Ther. 79° to 78° ; hard gale and violent squalls, with rain, and a tremendous heavy sea ; ship laboring much, sent guns, provisions, &c. into the hold ; ship lurching dreadfully. Lat. $14^{\circ} 47'$ N. long. $91^{\circ} 47'$ E.

3rd June.—Wind W½S. to WbS. Bar. 29° 40', 29° 33', and 29° 40'. Ther. 60°; hard gale with violent squalls and rain, and heavy sea throughout. Lat. 15° and long. 92° 14' E.

4th June.—Wind WbS. to WSW. Bar. 29° 40'; hard gale, violent squalls, rain and lightning; latterly the squalls more moderate. Lat. 16° 19' N. long. 69° 53' E. By observation find a current to the SW. at the rate of twenty miles per day for the last four days.

5th June.—Wind WSW. to SW. strong gale and squally, but moderating latterly, and the sea going down. Bar. 29° 40' to 29° 56', lat. 17° 59' N., long. 88° 34' E.

No. 23.—The ship "*Indian Oak*," Capt. Rayne, left Madras roads at 10 A. M. 4th June 1839, Nautical time, having a passenger on board for Vizagapatam. She ran up along the coast with moderate breezes, but on the night of the 5th to 6th June it was so very hazy that Capt. Rayne could not obtain an observation; the heavenly bodies being obscured. His barometer fell from 29° 7' at 8 P. M. on the 5th to 29° 6' at 4 A. M. on the 6th, the weather having assumed so very threatening an appearance, with a heavy jerking sea rising, that he prepared for bad weather, and kept under weigh whilst communicating with the shore, and landing his passenger at Vizagapatam; he had however no stormy weather. This vessel's log is important as marking, together with the memorandum from Masulipatam, that the gale was only *seen*, but not *felt* along the coast below Juggernath.

No. 24.—The Barque "*Lady Macnaghten*," Captain George Hardwick, experienced a severe gale beginning with strong squalls from the West and heavy rain at noon 30th May 1839, lat. 10° 40' N. long. 88° E. By noon the next day, 31st May, in 12° 45' N. 87° 14' she was hove too under close reefed main topsail, and continued so under storm sails on the 1st, 2nd, 3rd, and 4th June; wind from WbS. to SWbS. blowing a very severe gale with very heavy sea, causing the vessel to labour excessively and ship water over all. At noon on 4th, after which the gale moderated, she was in lat. 14° 51', long. 88° 16' E. and found that during the gale she had experienced a current of about thirty-two miles per day to the SW. from the 31st May to the 4th June; on which last day the Barometer being then at the lowest, stood at 29° 17'.

No. 25.—Brig "*Petrel*," Capt. Turcan, 1st June 1839. Nautical time.—At noon in lat. 5° 13' N. long. 85° 20' E. Bar. 29° 30'. Ther. 92', strong breezes from WSW. and hazy weather.

2nd June.—Till midnight blowing strong. A. M. blowing hard with hazy weather and a heavy sea; large white clouds driving very quickly, but clearing at intervals; wind from WSW. to SW. at noon, when the lat. was $8^{\circ} 31' N.$, long. $85^{\circ} 50' E.$ Bar. 29° , Ther. 86° .

3rd June.—Hazy in the afternoon, and first part of the night strong breezes, W. to WSW. till midnight warm weather. A. M. Hard gale, WbS. and a heavy sea till noon. Lat. $11^{\circ} 26' N.$, long. $85^{\circ} 24' E.$ Bar. $29^{\circ} 48'$ Ther. 95° .

4th June.—Hazy throughout and exceedingly warm. Sea high and confused, and coming at times from the northward! Hard gales WbS. WSW. ship taking much water on deck. At noon, lat. $13^{\circ} 44' N.$ $84^{\circ} 50' E.$ Bar. $29^{\circ} 43'$. Ther. 86° .

5th June.—Wind WSW. to SW. P. M. Hard gales, but moderating latterly. A. M. confused sea from the northward, hazy; barometer falling at 4 P. M. to $29^{\circ} 30'$ but rising towards morning to $29^{\circ} 50'$. Ship and rigging covered to day with a fine red dust.* At noon, lat. $16^{\circ} 22' N.$ long. $84^{\circ} 34' E.$ Bar. $29^{\circ} 38'$, Ther. 86° .

6th June.—Strong and hard gales WSW. with hazy weather. At 11h. $30'$ made the land. Noon, lat. $18^{\circ} 30' N.$ long. $84^{\circ} 34' E.$ Bar. $29^{\circ} 40'$ Ther. 86° Sky clearing up, and sea going down with appearances of settled weather. *Note.* We had not a drop of rain from leaving the lat. of $2^{\circ} 30' N.$ on 29th May until in Saugor roads on the 9th June.

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No. 26.—Barque "*John William Dare*," Captain Gibson, at anchor off the Island of Cheduba in  $3\frac{1}{2}$  fathoms water; on 1st June, 1839. Civil time.—Lat. observed  $18^{\circ} 44' N.$ ; long. by three Chrons  $93^{\circ} 50' E.$  Bar.  $29^{\circ} 80'$ , Ther.  $85^{\circ}$ . Latter part fine and clear. Bar.  $29^{\circ} 75'$ , Ther.  $84^{\circ}$ .

*2nd June.*—First part light breeze and clear, with lightning to the Southward; daylight freshening breezes, with flying showers of rain and light squalls, barometer falling. At noon strong breezes with squalls, and dark threatening appearance. Bar.  $29^{\circ} 40'$ , Ther.  $89^{\circ}$ . 2 P. M. Breeze increasing; preparing for bad weather. Bar.  $29^{\circ} 30'$ . Heavy sea rolling in from the Southward, ship rolling frightfully. 8 P. M. Breeze increased to a gale with tremendous sea. The ship, though drawing only eleven feet six inches water, struck by the heel and unshipped the rudder, secured the rudder, slipt the chain, cast to seaward, and an-

\* This is a singular phenomenon. The nearest point of the coast directly to windward of the ship is about Coringu, distant 400 miles. It would seem to indicate that the gale had blown over the table land of the Deccan, where it would probably find plenty of red dust. The Laurel Amelia and Indian Oak seem thus to have been sheltered by the Coromandel range of hills, as we see in the land breezes in an offing in fine weather.



chored again in four fathoms water. Latter part weather as before. Bar.  $29^{\circ} 30'$ .

*3rd June.*—First part heavy gale from SSE. with a tremendous sea ; vessel labouring heavily, and making thirty inches of water per hour. Daylight, barometer rising ; strong gale, with heavy thunder and rain, and dark heavy appearance all round ; noon, gale abating, with heavy squalls, thunder, lightning, and rain. Bar.  $29^{\circ} 50'$ , Ther.  $84^{\circ}$ . Latter, gale abating, with heavy rain and a high sea. Bar.  $29^{\circ} 60'$ .

*4th June.*—First part strong breezes with squalls, thunder, and heavy rain ; daylight, breeze abating ; Bar.  $29^{\circ} 75'$  Ther.  $85^{\circ}$ . Shipped the rudder, and sent up topgallant yards and masts. Latter part smart breezes. Bar.  $29^{\circ} 80'$ .

*5th June.*—Smart breezes from SE. and a high sea rolling in from SW. ; made sail for Chittagong. The direction of the wind has been omitted in this log on the 1st, 2nd, and 4th, but it seems evident that it was from the S. or between S. and SSE. throughout. The log is very valuable, as shewing that the gale here, on the extreme Eastern side of the Bay, was at its height in the night between the 2nd and 3rd June.

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No 27.—*Barque "Louisa," in the Harbour of Akyab.*

Saturday 1st June, 1839.—Moderate breezes and cloudy weather. Direction of the wind not stated, and nothing further in the log.

2nd June, 1839.—Commences with fresh breezes and cloudy weather ; middle and latter parts, hard gales with small rain ; winds Easterly.

3rd June, 1839.—During these twenty-four hours brisk gales and showers of rain ; winds Easterly.

4th June.—During these twenty-four hours the same as yesterday.

5th June.—During these twenty-four hours East winds with gales, and falls of rain.

6th June.—For these twenty-four hours, SW. winds and moderate.

To exhibit the foregoing Logs in a collected view, for ready reference, I have arranged all the principal facts in the following series of Tables from the 1st to the 5th June, exhibiting thus at one view the weather experienced by the different ships, and their positions *at noon* on the same day. No account has been taken of the small difference of apparent noon occasioned by the difference of longitude, as there is nothing which requires this degree of exactness. It will be remarked that throughout the difference between the Easterly and Westerly winds occurs about lat. $19^{\circ} 30'$. The log of the "Indian Oak" is omitted, as not being of importance.

Tabular view of the Gale and Hurricane in the Bay of Bengal, from 1st to 5th June, 1839.

| Date, Civil time. | Names of Vessels and Places. | Wind and Weather. | Lat. N. | Lon. E. | Bar. | Simp. | Ther. | Remarks. |
|----------------------|----------------------------------|----------------------------------|---------|---------|-------|-------|-------|------------------------|
| June 1st. Noon. | Calcutta, | NE. Cloudy and squalls at times, | 22.34 | 88.22 | 29.54 | .. | 92 | |
| | Diamond Harbour, .. | Light variable airs and Cloudy, | 22.11 | 88.11 | .. | .. | 84 | |
| | Kedgerie, .. | Do. do. Easterly do. do. thunder | 21.52 | 87.59 | .. | .. | 86 | |
| | Upper Light Vessel, Hope, ... | and lightning, | 21.26 | 88.07 | 29.54 | .. | .. | Heavy swell. |
| | Lower Light Vessel, Beacon, .. | W to S. variable. Cloudy, ... | 21.04 | 88.27 | .. | .. | .. | At anchor. |
| | Jane Pilot Vessel, | NE to ENE. Cloudy & unsettled, | 21.00 | 88.23 | .. | .. | .. | { Sharp lightning to |
| | H. C. Ship Amherst, | ENE to ESE. Light & variable | 20.56 | .. | .. | .. | .. | { NE. |
| | Saugor Pilot Vessel, .. | Variable sharp squalls from SE. | 20.28 | 87.32 | .. | .. | .. | { At anchor, AM winds |
| | At Pooree, or Juggernaut Pagoda, | to NE. with rain, .. | 19.48 | 85.45 | .. | .. | .. | { SE. to southward. |
| | John William Dare, | NNE. to N. and cloudy to E. .. | 18.44 | 93.50 | 29.75 | .. | 84 | { At anchor off Che- |
| | Mary Somerville, .... | ..... | 18.13 | 85.17 | 29.65 | 29.78 | 86 | { duba. |
| | Justina, | Fine and clear. | .. | .. | .. | .. | .. | No Logs obtained. |
| | Ann Lockerby, | NNE. to WNW. Light air, very | .. | .. | .. | .. | .. | |
| | Eden, | hot weather, .. | .. | .. | .. | .. | .. | |
| | At Masulipatam, .... | ..... | 16.10 | 81.00 | 29.70 | .. | 85 | |
| | Nine, | W b.S. Strong gale with hea- | 14. 7 | 85.28 | 28. 7 | .. | 82 | |
| | Elizabeth, .. | vy squalls and rain, .. | .. | .. | .. | .. | .. | |
| | Jumna, | W to WSW. Freshening to a | 12.25 | 85. 0 | .. | .. | .. | { Bar. falling. Much |
| | .. | gale. Dark gloomy wea- | .. | .. | .. | .. | .. | { lightning to NW. |
| | Susan, | ther, .. | 14. 2 | 91.14 | 29.50 | 29.40 | 78 | { N. and NE. |
| | .. | W b.N to WSW. Hard gale with | .. | .. | .. | .. | .. | |
| | .. | heavy squalls and rain, .. | .. | .. | .. | .. | .. | |
| | Lady Macnaghten, .. | W b.S. to W. b.S. a very severe | 13.50 | 88.00 | .. | .. | .. | { Heavy sea. Ship- |
| | .. | gale, hove too under storm | .. | .. | .. | .. | .. | { ping water over all. |
| | Petrel, | sail, | 5.13 | 85.20 | 29.30 | .. | 92 | |
| | .. | W.S.W. Strong breezes and hazy, | .. | .. | .. | .. | .. | |

| Date. Civil time. | Names of Vessels and Places. | Wind and Weather. | Lat. N. | Lon. E. | Bar. | Sump. | Ther. | Remarks |
|----------------------|--------------------------------|-----------------------------------------------------------------|---------|---------|-------|-------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| June 2nd. Noon | Calcutta, | E.b.S. Heavy clouds and passing squalls with rain. | 22.34 | 68.22 | 29.47 | .. | 90. | |
| | Diamond Harbour, .. | Variable, cloudy and rain. | 22.11 | 68.11 | .. | .. | 83. | |
| | Kedgerie, .. | Northerly with Easterly squalls. | 21.32 | 67.59 | .. | .. | 83. | { Calms, thunder and lightning. |
| | Upper Light Vessel, Hope, | cloudy and rain, | 21.26 | 68.07 | 29.52 | | | |
| | Lower Light Vessel, Beacon, .. | Northerly wind, with heavy squalls from Eastward, .. | 21.04 | 68.27 | | | | |
| | Jane Pilot Vessel, | ENE North breezes but threatening a gale, | 21.01 | 68.23 | .. | .. | .. | { At Anchor; strong set to the Westward. |
| | H. C. Ship Amherst, | Fresh from N.E. with squalls and rain, | 20.56 | 68.23 | | | | |
| | Krishna Pilot Vessel, | ENE to NNE. in heavy squalls and rain, | 20.43 | 67.25 | | | | |
| | Saugor Pilot Vessel, .. | NE. to E. Squally and threatening to Eastward, | 20.28 | 67.32 | .. | .. | .. | At anchor. |
| | At Pooree, or Juggernaut, | Squally from the Eastward, | 19.48 | 65.45 | | | | |
| | John William Dare, .. | S.b.E. Strong breezes, squalls and dark threatening weather, .. | 19.41 | 63.50 | 29.40 | .. | 82. | { At anchor at Cheduba. Bar. falling to 29.30; p.m. Heavy sea from Southward. p.m. Severe squalls from N.E. car. away from N.E. topmast and F. & Main T. G. Mast. No Logs for this day obtained. |
| | Mary Somerville, | Lt breezes WNW. to fresh from North, | 19.56 | 65.56 | 29.61 | 29.73 | 85. | |
| | Justina, .... | .... | .. | .. | .. | .. | .. |  |
| | Ann Lockerby, .... | .... | .. | .. | .. | .. | .. |  |
| | Eden, .... | .... | .. | .. | .. | .. | .. |  |
| | At Masulipatam, | Blowing fresh WNW. to SSW. Drizzling rain, | 16.10 | 81.00 | 29.70 | .. | 88. | |
| | Nine, | W.b.S. Heavy gale, severe squalls and rain, | 16. 7 | 85.52 | 28. 6 | .. | 83. | |
| | Elizabeth, .. | Severe gale from SW. | 16.00 | 88.00 | .. | .. | .. | { Heavy cross sea; stern stove in; bore up. |
| | Junna, | West to WSW. Gale and rain. | 15.20 | 85.30 | | | .. | |
| | Mobile, .. | Moderate from NNW. | 16.20 | 84.30 | | | .. | |
| | Susan, | W.b.S. to WSW. Hard gale, violent squalls and rain, | 14.47 | 91.47 | 29.38 | .. | 79. | Tremendous cross sea |

| Date, Civil time. | Names of Vessels and Places. | Wind and Weather. | Lat. N. | Lon. E. | Bar. | Simp. | Ther. | Remarks. |
|----------------------------------|--------------------------------|------------------------------------------------------------------------|---------|---------|-------|-------|-------|------------------------------------------------------------------------------|
| June 2nd Noon. | Lady Macnaghten, .. | W. b S. to SW. b S. Very severe gale. Hove too under storm sail. | 14.10 | 85.00 | .. | .. | .. | { Heavy sea. |
| (Continued.) | Petrel, | W S W. to S W. Blowing hard. Hazy weather. | 8.31 | 85.50 | 29.00 | .. | 86. | |
| Monday, June 3rd. | Calcutta, .. | E. b N. Fresh gale, heavy squalls and rain at times. | 22.34 | 88.22 | 29.43 | .. | 89. | |
| Noon Centre of the Hur- | Diamond Harbour, .. | NE. breezes, frequent rain, | 22.11 | 88.11 | .. | .. | 84. | |
| cane about | Kodgerie, .. | Heavy squalls N E. to East. rain and unsettled appear- | 21.52 | 87.59 | .. | .. | 84. | |
| Lat. 19° 53' N. Long. 89° 45' | Upper Light Vessel, Hope, | Strong E S E. winds inclin- | 21.26 | 88.07 | 29.41 | .. | .. | { Gale increasing ra- |
| E.? | Lower Light Vessel, Beacon, .. | creasing to a gale at ENE. | 21.04 | 88.27 | .. | .. | .. | { pidly p.m. E. to ENE. Heavy sea on. |
| | Jane Pilot Vessel, | from E N E. heavy squalls, NE. Strong and increasing | 21.80 | 88.23 | .. | .. | .. | At anchor. |
| | H. C. Ship Amherst, | gales, with rain; threaten- | .. | .. | .. | .. | .. | Sea rising fast. |
| | Krishna Pilot Vessel, .. | ing to NE. | 20.37? | 87.26? | .. | .. | .. | Cross sea. |
| | Sarab, | ENE. Increasing gale and rain. Pleasant and cloudy NE. to E | 20.30 | 88.02 | .. | .. | .. | { At anchor, hvy. swell from SE. gale freshg. from N E. at midnight. |
| | Saugor Pilot Vessel, | N. Strong breezes. | 20.28 | 87.32 | .. | .. | .. | |
| | At Pooree, or Juggernaut. | N. Hard gale heavy clouds and rain. | 19.48 | 85.45 | .. | .. | .. | |
| | John William Dare, | S S E. Heavy gale A. M. dark heavy weather, | 18.44 | 93.50 | 29.50 | .. | 84. | { At anchor at Cheduba p.m. gale abating; Br. rising; rain & hvy. sea. |
| | Mary Somerville, | Very unsteady, mostly N W. with heavy squalls, .. | 19.30 | 85.29 | 29.25 | 29.40 | 86. | |
| | Justina, | N. Increasing gale heavy squalls and rain. | 19.14 | 86.06 | .. | .. | .. | |
| | Ann Lockerby, .... | .... | .. | .. | 29.40 | .. | .. | No log. |
| | Eden, | Blowing strong W S W. to W N W. and rain. | 18.22 | 86.01 | 29.69 | .. | 87. | Barometer falling. |
| | At Masulpatam, .. | W N W. to S W. Drizzling rain, cloudy, | 16.10 | 81.00 | 28.6 | .. | 84. | |

| Date, (civil time.) | Names of Vessels and Places. | Wind and Weather. | Lat. N. | Lon. E. | Bar | Simp. | Ther. | Remarks. |
|-------------------------------------|--------------------------------|---------------------------------------------------------------------------|---------|---------|-------|-------|-------|------------------------------------------------------------------------------------------------|
| Monday, June 3rd. (Continued) | Nine, | Strong gale and heavy squalls W.b.S. | 17.00 | 85.16 | .. | .. | .. | { Scudding for a port no log. |
| | Elizabeth, | Gale at SW. | .. | .. | .. | .. | .. | { Lightg. & ceaseless rain, awfully dark to N.W. & N. wind of- fering to shift there. |
| | Jumna, | Heavy gale from W. to WSW. | 16.40 | 85.30 | .. | .. | .. | |
| | Mobile, | Strong gale and heavy gusts from the Westward, .. | 15.00 | 84.00 | 29.49 | .. | .. | |
| | Laurel Amelia, | Westerly drizzling rain and strong gales, | .. | .. | .. | .. | .. | |
| | Susan, | W.b.S. W.b.S. Hard gale, vio- lent squalls and rain, | 15.00 | 92.14 | 29.35 | .. | 80 | |
| | Lady Macnaghten, | W.b.S. to SW.b.S. Very severe gale; hove too under storm sail. | 14.25 | 88.09 | .. | .. | .. | |
| | Petrel, | W.b.S. Hard gales, | 11.26 | 85.24 | 29.48 | .. | 95 | Heavy sea. |
| | Calcutta, | East, heavy squalls and gusts with rain, | 22.31 | 88.22 | 29.49 | .. | 86 | |
| | Diamond Harbour, | N.E. Strong breezes, frequent rain, | 22.11 | 88.11 | .. | .. | 84 | |
| | Kedgerie, | Heavy Easterly squalls, rain and unsettled weather, .. | 21.52 | 87.79 | .. | .. | 85 | |
| | Upper Light Vessel, Hope, .. | ESE. Heavy gale and rain, | 21.26 | 88.07 | 29.33 | .. | .. | { Midnight, veering to SSE. Heavy sea on, gloomy weather. |
| | Lower Light Vessel, Beacon, .. | ESE to SE. do. do. rain, | 21.01 | 88.27 | .. | .. | .. | { Sea washing over everything; gloomy appearance all round |
| | Jane Pilot Vessel, | From E. to ESE. and SE Hard gale and rain, | 21.00 | 88.23 | .. | .. | .. | { At anchor; dark gloomy weather and heavy sea. |
| | H C. Ship Amherst, | ENE. A hard gale and rain, | .. | .. | .. | .. | .. | { Under bare poles At a.m. a hurricane at SSE. tremendous cross sea. |

Tuesday,
June 4th.
At Noon.
Centre of the
Hurricane a-
bout
19-36 N.
88 10 E.

| Date, Civil time, | Names of Vessels and Places, | Wind and Weather. | Lat. N | Lon. E. | Bar. | Simp. | Ther. | Remarks. |
|--------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------|--------|---------|------------------|---------------------|-------|--------------------------------------------------------------------------------------------------------------------------------|
| Tuesday, June 4th. (Continued) | Krishna Pilot Vessel, | NNW. to NNE. Fresh gales, hard squalls, | 20.10 | 87.15? | .. | .. | .. | { High crosssea, stood off land. |
| | Sarah, | ESE. Hard gales with rain, | .. | .. | { 28.88 28.56 | 8. P.M. midnight | 28 | { 2 P.M. Wind veered to the South. |
| | Saugor Pilot Vessel, ... | NE. Hard gale, | 20.28 | 87.32 | .. | .. | .. | { At anchor, heavy sea. |
| | At Pooree, or Juggernaut, | North. Hard gale, incessant rain, | 19.48 | 86.45 | .. | .. | .. | { duba. 5 P.M. Shifted suddenly to the W. |
| | John William Dare, | South, moderate. | 18.41 | 93.50 | 29.75 | .. | 85 | { & veered gradually to SW. |
| | Mary Somerville, | W. Fresh gales with heavy rain, | 19.16? | 85.15? | 29.15 | 29.30 | 86 | { Heavy sea from SE. P.M. gale increasing from SW. |
| | Justina, | WSW. Severe gale veering to South Westward, P.M. | 18.47? | 35.40? | .. | .. | .. | { Lying with yard arms at times in the water; tremendous sea running; lost a boat washed away. Gale increasing. |
| | Ann Lockerby, | N to NNW. Commenced to blow heavy and rain, | 18.55 | 86.30 | 28.75 | .. | .. | .. |
| | Eden, | SW by W. Hard gale increas- ing to a hurricane at WSW. | .. | .. | 29.10 | .. | 83 | .. |
| | At Masulpatam, | WNW. blowing very fresh, | 16.10 | 81.00 | 29.63 | .. | .. | .. |
| | Nine, | W by S. moderating to fresh gale, | 17.39 | 86.43 | .. | .. | .. | .. |
| | Elizabeth, | From W to WSW. Gale con- tinuing and heavy squalls | 17.10 | 85.35 | 29.19 | .. | .. | { Preparing for bad weather. |
| | Junna, | Heavy Westerly gales, | 15.50 | 84.40 | .. | .. | .. | { A current has been setting to the SW. for the last 4 days. |
| | Mobile, | West, hard gales, | 16.56 | 82.58 | .. | .. | .. | .. |
| | Laurel Amela, | WSW Hard gale violent squalls W by S to W by S. Very severe gale; hove too under storm sails, | 16.19 | 80.53 | 29.40 | .. | .. | { Current of 32 per day to the SW. for the last 4 days. |
| | Susan, .... | ..... | 14.51 | 83.16 | 29.17 | .. | .. | { Sea confused, and coming at times from the Northward, shipping much water |
| | Lady Macnaghten, .... | ..... | .. | .. | .. | .. | .. | .. |
| | Petrel, | W by S to SW by S. Hard gales, hazy | 13.44 | 84.50 | 29.43 | .. | 86 | .. |

| Date, Civil time. | Names of Vessels and Places | Wind and Weather. | Lat. N. | Lon. E | Bar. | Simp. | Ther. | Remarks. |
|------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------|---------|--------|--------|--------|-------|-----------------------------------------------------------------------------------------------|
| June 5th. Noon, Centre of the Hurri- cane, about Lat. 19° 25' N. Lon. 87° 1' E. | Calcutta, | S. b E. Veering to Southward, strong squalls and rain. ... | 22..34 | 88..22 | .. | .. | .. | { No observation for Barometer. |
| | Diamond Harbour, | E to SSE. Strong gales & squalls SE. to S. smart gale and rain, ... | 22..11 | 88..11 | .. | .. | 84 | |
| | Kelgerree, | South; gale decreasing, rain. ... | 21..52 | 87..59 | 29..46 | .. | 85 | Heavy sea. |
| | Upper Light Vessel, Hope, ... | S S E. to South, blowing hard in squalls, | 21..26 | 88..07 | .. | .. | .. | Heavy sea. |
| | Lower Light Vessel, Beacon, ... | SSE. to S. Heavy squalls, | 21..04 | 88..27 | .. | .. | .. | At anchor. |
| | Jane Pilot Vessel, | Gale moderating from SSW. ... | 21..00 | 88..23 | .. | .. | .. | Heavy cross sea. |
| | H. C. Ship Amherst, | North to West and SW hard gales, | 20.. 3 | 87..00 | .. | .. | .. | { 1 p.m. Wind veered from N. to SW. fu- rious gale. |
| | Krishna Pilot Vessel, | E S E. Moderating and veer- ing round to southward ... | 19..42 | 86..27 | .. | .. | .. | { At anchor; p.m. SE. & SSE. at midnigh. |
| | Sarah, | ESE. Hard gale, | 20..28 | 87..32 | .. | .. | .. | |
| | Saugor Pilot Vessel, | S W. Gale continuing, cloudy but no rain, | 19..48 | 85..45 | .. | .. | .. | |
| | At Pooree, or Jaggernaut, ... | S W. Strong breezes increas- ing to a severe gale to South SW. Moderating, | .. | .. | .. | .. | .. | { Veering to SW; p.m. Sea from the S. W. |
| | Mary Somerville, | Hurricane at N N W. shifting suddenly to W S W. at noon | 18..15 | 85..11 | .. | .. | .. | |
| | Justina, | SW. Moderating, | 19.. 5 | 87.. 6 | 28..15 | .. | .. | |
| | Ann Lockerby, .. | SW. Moderating, | 18.. 1 | 86..52 | 29..25 | .. | .. | |
| | Eden, | WNW. Blowing very fresh, ... | 16..10 | 81..00 | 29..60 | .. | .. | { Current of 60, to the S. during the gale. Running for a port. No log for this day. |
| | At Masulipatam, ... | SW. Fresh gale and heavy squalls, | 18..39 | 86..18 | .. | .. | .. | |
| | Nine, .... | .... | .. | .. | .. | .. | .. |  |
| | Elizabeth. .. | .... | .. | .. | .. | .. | .. |  |
| | Junna, | Severe westerly gale, | 16..20 | 85..20 | .. | .. | .. | |
| | Mobile, | Westward, blowing a hurricane, W-SW. and SW. moderating, ... | 17..22 | 83..44 | .. | .. | .. | { Scudding gunder bare poles. |
| | Laurel Amelia, | W-SW. Moderating, ... | 17..59 | 88..34 | 29..40 | 29..55 | 83 | |
| | Susan, | W-SW. Moderating, ... | .. | .. | .. | .. | .. | |
| | Lady Macnaghten, | W S W. to S W Hard gales, but moderating, hard, ... | 15..22 | 81..34 | 29..38 | .. | 86 | { At 4 p.m. Bar. 29.32 A confused sea from the North. |
| | Petrel, | .. | .. | .. | .. | .. | .. | |

I have next delineated the whole of the tracks with the winds at noon upon the general Chart, and from these are deduced the centres, which last I have marked by a single circle or two for each day, and from the centres I estimate the course of the hurricane. To render the whole more distinct, three diagrams are also given, to half scale, upon which I have a few remarks to make.

In considering these diagrams and tables, the reader will be struck with some few anomalies ; that is, he will observe that the arrows do not always show the wind as blowing in *exact* circles, and that in one or two instances, they are altogether different from the others, though not absolutely contradictory.

I take these few discrepancies mostly to arise from some one of the following causes :—

I. The carelessness of many in noting the direction of the wind, or the not noting it *at the time*.

II. Their erroneous estimation of its direction when looking at a weather-cock or dog-vane, and, if a ship is going fast, the not allowing for the effect of her motion upon it.*

III. On shore, local circumstances, such as houses, hills, rivers, and the like, which may often produce differences.

IV. At sea the vicinity of the land, ranges of mountains, &c. which when the gale or hurricane strikes them, occasion a re-action altering the direction of the wind.

V. As it has been necessary to fix upon one instant of time at which to compare the wind and weather experienced by different vessels, noon has of course been chosen ; but when the winds are varying, it may occur that the one marked about noon is a little more unfavourable to the appearance of the diagram than that which perhaps was the predominant one throughout the day ; as, however, it would have appeared like accommodating the facts to the hypothesis, I have preferred allowing them to stand as marked, taking a mean point where the limits of the variation of the wind are expressed, such as SE. when the words “ between South and East,” are used.

VI. The positions of the vessels are rarely accurately ascertained in a severe gale.

Let us consider these causes separately. The careless habits of seamen are well known, and that these should extend to what is apparently the unimportant matter of noting the exact direction of the wind is not surprising, and is well known to every intelligent man, who has commanded a vessel. In severe weather too when a vessel

* The eddy wind from the mizen staysail will sometimes in a small ship affect the dog-vane.

is lying with her yard arms in the water, boats and booms washing away, and sails blowing from the yards, those on whom the responsibility rests have far other matters to engage their attention than the exact direction of the wind; and in many vessels, where perhaps the captain and chief mate are the only persons who can take charge of the deck in such weather, the log is rarely marked till the gale ceases, and it is written up perhaps at a still later period. "You must not look for very great exactness in my log, Sir, for to tell the truth, every word of it was written from memory after the gale was over; myself and the mate had something else besides writing to do while the gale lasted," was literally said to me by one commander; and no doubt this is necessarily true of many, as those who know the severe fatigue of body, and excessive anxiety of mind which the masters of small vessels must undergo in bad weather will readily allow.*

2nd. That when the vessel is going fast through the water the dog-vane shews the wind to be further a head than it really is, is well known to all; when close hauled on a wind, as the vessel lies about six points from it, there is no mistake of any consequence to be made, but with the wind abeam or a point or two abaft it, many officers do not, if they know it, make due allowance for the ship's motion. If the wind appears to be abeam it is put down so, though it is perhaps half a point or more abaft it. The experienced and attentive do not of course fall into these errors; but how many are there who unite both experience and attention? Looking at a weather-cock on shore, or merely estimating the direction of the wind, is more liable to be inaccurate; even to the extent of a point or two.

3rd. Local circumstances, such as I have alluded to, require no remark, particularly when an observer is living in a large town, or has not a very exact idea of his meridian; which but few have.

4th. This cause will be more particularly alluded to in Part II of this memoir; at present with reference to one diagram the anomalies about Juggernaut, or as the ships approach the shore, seem quite probably referable to the repulsion of part of the vortex from the high land behind Cuttack; or to the great current of the regular monsoon gale, blowing up along the Coromandel hills. See Part II.

5th. The fifth cause explains itself, as stated.

* *Note.*—While this is going to the press I meet in the Nautical Magazine for March 1839, in a valuable paper on a hurricane, "Yesterday I did not put down the latitude and longitude. I calculated it roughly in my own mind, and satisfied myself the Barque was driving clear of the shoals. I was too much occupied, both mentally and corporeally, to enter into minute calculations."—*Extract from a letter signed 'Mexicano,' giving an account of a gale off the coast of Mexico.*—*Nautical Magazine, March, 1839.*

6th. The sixth requires none to seamen, but the unprofessional reader should be told, that, not only from the motions of the vessel and the haziness of the horizon, observations during stormy weather are entitled to but little confidence, but moreover they are but very seldom obtained, the celestial bodies being rarely visible ; thus the latitude and longitude of the vessel is in truth but little better than guessed at if she is lying to, because neither the direction nor the rate of her drift can be well *measured* by the log, or accurately known by the compass ; as it may be when scudding. Hence it must be borne in mind that, though the wind may be rightly noted, the ship's position may be to a certain extent erroneously laid down, and in some instances upon the diagram, if the vessel be supposed to have been little further to the East or West, or to the North or South, the apparent difference will disappear.

The Sarah in the diagram of the 4th is an instance. By the direction of the wind she should be further to the Eastward ; but I estimated her to be where I have placed her. At 2 p. m. also, as will be seen by her log, the wind veered to the Southward with her ; the centre of the vortex having passed her at no great distance ; the weather moderating till 4 p. m. when it again came on to blow a hard gale.

It may be observed to, and this is important, that while probably, and frequently no doubt from the causes just enumerated, there are discrepancies in the winds as laid down, these rarely, or never, amount to *contradictions* of the theory ; which defines a hurricane to be a severe gale blowing and veering round in a circular direction, while it is also moving onwards. I should note also that in more than one instance I have found no wind marked exactly at noon, but one at 10 a. m. or 2 p. m. With this explanation of the diagrams and charts the unprofessional reader will be better able to make allowance for the differences he may meet with ; and all will observe how well the blank which occurs on the eastern side of them will be filled up by the logs of the homeward bound vessels. The description of the Map No. II. belongs to Part II. to which it has reference.

The slow rate of progress of our hurricane will not fail to be remarked. I think it probable this is owing to the vortices being *pent up* as it were between the course of the gale and the Coromandel Hills. I have further adverted to this also in Part II.

A few more remarks on the Logs and Charts may not be without interest, both to the unprofessional reader, and to the seaman who may not at once perceive how they bear upon the theory of the circular motion of storms ; and that this is from East to West by the North, or contrary to the hands of a watch, on the North side of the equator.

Let us begin with the H. C. S. *Amherst*, which we find very properly stood out to sea from the tail of the Eastern sea reefs. Had her Commander not been acquainted with the Sand Heads, she might have been placed in great danger by standing in, as she then must have anchored in a most perilous position. This was probably the fate of the unfortunate *Protector*, in which 135 soldiers were lost beside the crew and the passengers, in the gale of October, 1838.*

The Pilot vessels, whose business moreover it was to keep as near to their station as they could with safety, were well managed of course ; as were also the *Sarah* and I believe the *John Hepburne*, a Schooner from Rangoon ; though I have not been able to procure this last vessel's log.

On the South-side of the hurricane, however, many of the vessels seem running into it, and this some of them certainly did. The *Mary Somerville* was fortunately prevented from doing so, by the accident to her foretop-mast, obliging her to lie too, but the *Ann Lockerby*, *Justina*, and *Eden* seem to have run right towards it.

The *Susan's* track shows a course made much too far to the Westward for the winds laid down ; this is only to be accounted for by the erroneous estimate of her position, and the Westerly current which is adverted to in the logs of the *Nine* and *Jane*.

The barometrical observations are for the most part so few and scattered that I have been unable to trace any connected series of them worth adverting to. As usual the barometer has clearly enough announced the approach or vicinity of bad weather, and the Simpiesometer still earlier. I have before stated that I was unable to obtain more than *one* single notice of the heights of the vessels' barometers in the port of Calcutta ! and thus we are left to doubt as to the correctness of even those instruments of which we have the registered observations. Thus the 'Nine's' barometer indicated a very remarkable depression on the 1st, 2nd, and 3rd June, but was it a correct one ? The low rate of pay on board our merchant ships makes it a heavy tax upon a commander to provide himself with instruments from the best makers. I cannot quit this part of the subject, however, without citing the highly creditable barometrical observations of Mr. Hudson, commanding the Honorable Company's Floating Light Vessel "Hope," marked in the tables as the Upper Light Vessel. I have only there quoted his barometer for noon ; the following is the register annexed to his log, and brief notes of the weather from it —

* The remarks on the appearance of the Arracan mountains on the 29th, and the clear sky and peculiar sensibility to noise on board at the approach of the gale, are very interesting : the two last may have been electrical phenomena, and the first will remind the seaman of "the Devil's table cloth," at the approach of a South-easter in Table Bay.

| | | | |
|-------------------|----|-------|-----------------------------------------------------------------------|
| 1st June, | .. | Bar. | |
| 8 A. M. | .. | 29.56 | East to NEbE. winds and cloudy to the WN. NE to ENE. and cloudy. |
| Noon, | .. | 29.54 | |
| 8 P. M. | .. | 29.53 | |
| 2nd June, | .. | Bar. | |
| 8 A. M. | .. | 29.53 | ENE. cloudy unsettled, midnight heavy squalls from ENE. with rain. |
| Noon, | .. | 29.52 | |
| 8 P. M. | .. | 29.17 | |
| 3rd June, | .. | Bar. | |
| 7 A. M. | .. | 29.43 | Strong NE. winds and threatening weather. |
| Noon, | .. | 29.11 | Strong ESE. winds inclining to a gale |
| 1.30 P. M. | .. | 29.37 | Increasing to a gale; prepared for bad weather. |
| 2.30 P. M. | .. | 29.33 | |
| 6 P. M. | .. | 29.33 | Gale increasing at ENE. |
| 4th June, | .. | Bar. | |
| 4 A. M. | .. | 29.33 | Gale continuing in hard gusts from East. |
| 8 A. M. | .. | 29.33 | Weather as before. |
| Noon, | .. | 29.33 | Gale blowing in heavy squalls from ESE. |
| 8 P. M. | .. | 29.33 | Gale continuing, veering to SE. |
| Midnight, | .. | — | Gale veering to SSE. |
| 5th June, 8 A. M. | .. | 29.46 | Gale still continuing at SSE. veering to S. |
| Noon, | .. | 29.46 | Gale decreasing a little, wind at S. |
| 8 P. M. | .. | 29.46 | Strong breezes at S. |

From the height of this Barometer on the 1st as compared with that at the Surveyor General's Office in Calcutta, we may assume it to be a nearly correct one; and if these dates are compared with the assumed track of the hurricane—at least at 120 miles distant from Captain Hudson's vessel—it is scarcely an exaggeration to say that this instrument was marking the passage of it over his meridian with the regularity of a clock! A stronger instance of the vast utility of the Barometer and the use of having them on board all stationary vessels could scarcely be adduced. A good Simpiesometer would have given us still more curious data. It is, I hope, becoming daily more and more evident that the owners of all vessels should be obliged to furnish them with good instruments of all kinds; and indeed if they knew their own interests they would always do so. The cost of a very small portion of the delay and mischief arising from damage occasioned by the want of one,—and these are frequently not losses falling upon underwriters,—would far more than repay the cost.* The seaman who is watching his Barometer is watching his ship; and watching it too in the most intelligent manner.

* Col. Reid's observation on this subject deserves to be quoted. "Every policy of insurance should bind the owners or masters of a ship insured to provide a Barometer, and the protest should be required to shew that it was registered at least once in every watch. But it ought to be registered oftener; and within the tropics, during the hurricane season, every time the log is heaved." I should add that a Simpiesometer ought always to be insisted upon also.

ART. V.—*Note on the “Trochilus and Crocodile” of Herodotus.*

To the Editor of the Asiatic Journal.

DEAR SIR,—As the recent very curious and instructive work of Mr. Wilkinson on the *Manners and Customs of the Ancient Egyptians* is likely to attain a deserved celebrity, it may be as well to correct a mistake into which he has fallen, as to a fact in natural history, particularly as it affects the credit of the Father of History, whose work, notwithstanding its imperfections in many other respects, will generally be found correct in all matters that came under the author's personal observation.

Mr. Wilkinson says, vol. iii. p. 79,

“Herodotus enters into a detail of the habits of the Crocodile, and relates the frequently repeated story of the *Trochilus* entering the animal's mouth during its sleep on the sand banks of the Nile, and relieving it of the leeches which adhere to its throat. The truth of this assertion is seriously impugned, when we recollect that leeches do not abound in the Nile; and the polite understanding supposed to exist between the Crocodile and the bird, becomes more improbable, when we examine the manner in which the throat of the animal is formed; for having no tongue, nature has given it the means of closing it entirely, except when in the act of swallowing, and during sleep the throat is constantly shut though the mouth is open.”

Now on this passage I have to observe, first, that I have seen many Crocodiles caught, but very few that had not many leeches adhering to the inside of their mouths, and that these insects also infest the *Argeelah*, and other animals which feed in the Ganges. Secondly, these leeches are not the *Hirudo medicinalis*, which Mr. Wilkinson is probably correct in asserting not to be common in the Nile, as that species is not usually found in running streams. The leech in question seems to me (I speak with diffidence, being no entomologist) to belong to the genus *Pontobdella*, one species of which infests Cod, Skate, and other fish on the coasts of England. I have no doubt these insects will be found as abundant in the Nile as they are in the waters of Bengal. Thirdly, Herodotus says nothing about the throat of the Crocodile, though his translator Mr. Beloe does. Herodotus says, “the *Trochilus* entering the Crocodile's mouth devours the leeches,” for his words are, *εὐθαῦτα ὁ τροχίλος ἐσδύνων ἐς τὸ στόμα αὐτοῦ καταπίνει τὰς βδέλλας*.*

* Herod. Euterpe. clixviii

The Crocodile is not said by Herodotus to be sleeping during the operation, as Mr. Wilkinson asserts, otherwise the observation, "that pleased with the service, he never injures the *Trochilus*," would be absurd—*ωφέλειμνος ἦδεται καὶ οὐδὲν σίνεται τὸν τροχίλον*.*

Fourthly, as to the polite understanding which Mr. Wilkinson presumes, this may appear strange to a person only acquainted with wild animals as seen in showmen's caravans and menageries, but not to those who have studied their habits in their native haunts. The facts relating to this subject are worthy of more consideration than I can give them, without deviating from my present purpose; I will therefore only add, that I believe the common Paddy bird of Bengal to be the *Trochilus* of Herodotus, or a bird of the same genus. Now both Europeans and Bengallees agree in asserting, that this bird is constantly seen standing on the head of the Crocodile, and though I never heard any one assert that he saw it in the act of picking his teeth for him; I think it will be admitted that the visit is not without an object.

I am, dear Sir,

Yours very truly,

W. C. HURRY.

COSSIPORE,
September, 1839.

ART. VI.—*Documents relative to the application of Camel Draught to Carriages; communicated by C. B. GREENLAW, ESQ., Secretary to the Bengal Steam Committee.*

At a period when the applications of steam to locomotive purposes absorb the attention of the civilized communities of the world, it may seem almost too late to propose new directions of animal power to this object. The copious extracts we now publish from the documents of the "Steam Committee" and of other authorities, will place the subject in a different light. We willingly devote our pages to its consideration, in the conviction of its great value to all classes of Indian Society.

The discovery of the applicability of the Camel to the draught of carriages of every kind, we regard as one of surpassing value to countries of the peculiar climate, and in the still more peculiar social state in which India and Egypt exist, and through which for more than one generation they must slowly and almost insensibly advance.

* Herod. Euterpe. clxviii.

To Major Davidson, of the Bengal Engineers, we believe must be assigned the signal credit of having first demonstrated the practicability of using the Camel for carriage draught. Some years have elapsed, since Major Davidson exhibited a Camel harnessed to a light car, on which he travelled at the rate of eleven to fourteen miles an hour, and executed daily stages of thirty-six miles for several days in succession. Encouraged by this example, Mr. Bird, of Allahabad, constructed the carriage of which we publish a striking sketch and plan, and in which he has accomplished the tours described by Mr. Taylor, in his note published in the present series of documents ; for the illustrations we are indebted to the kindness of the Hon. Mr. William Wilberforce Bird, of Calcutta.

In a subsequent number we hope to be enabled to publish interesting details regarding the Camel Artillery organized by Major Pew, and which, throughout the whole of the trying march on Cabul, has given such perfect satisfaction to the projectors of this important addition to our military resources. Meanwhile, the papers we subjoin, afford copious information on the practical points to be considered in attempting to introduce this system on the great line of communication through Egypt and in India. Under the auspices of the British Consulate, and the direction of Mr. Walne, we are sanguine as to the early success of the attempt to establish across the isthmus of Suez a train of vehicles in celerity only inferior to the steam vans, of which the Camel is the certain precursor.—EDS.

*Extracts from a letter to CAPTAIN BARBER from ALFRED WALNE, ESQ.,
Vice-Consul in Cairo.*

Her Majesty's Vice-Consulate, Cairo, 17th March, 1839.

[*Comparative expenses of Horse and Camel draught in Egypt.*]

I question altogether the feasibility of finding persons in Egypt willing and able to contract for a supply of one hundred and twenty horses, to drag the ten vans, which are for the carriage of coals to Suez, and of goods from that place. But supposing even that persons were ready to come forward with the capital, it would be impossible for them to find here horses suitable for such an undertaking. The horses of Egypt, as experience has proved, are not in the least calculated for draught, and not at all accustomed to it ; and even if they were, the wear and tear in this climate, more particularly in the deserts,

would lead to a constant and serious loss. Supposing however that the horses are provided, *and it is only England that can supply them*, we must calculate the annual cost, compared with the work they can perform, and again with that of Camels; which, whatever may be the opinion in Europe, are the best, because the natural means of conveyance for a desert road. Premising that the following calculations are only approximative, inasmuch as the price of provisions varies considerably from year to year, I proceed to offer you the following details of expense.

120 horses, being constantly employed for three hundred days of the year, will consume $1\frac{1}{2}$ roobs of barley per diem; in all 54,000 roobs, or 2,250 ardebs, of which the price has varied in the last two years from p. 30 to 65, and even more. Taking it at the calculation of p. 40 we have this result, $2,250 \times 40$ p. 90,000. Four-fifths of this being for the stables in the desert, or for those in Suez, will require carriage, which, taking the long and short distances into full consideration, cannot be computed as averaging less than p. 15 the ardeb, or $1,800 \times 15 =$ p. 27,000.

It is calculated that with the above supply of corn, each horse will require *per diem* 4 okes of cut straw (tibne), which, purchased with the greatest advantage, will, at the Government price, cost 4 paras the oke. Thus $120 \times 4 = 480 \times 4 = 1,920$, or paras 48 per diem— $48 \times 300 =$ paras. 14,400.—

Of the 120 horses, 96 would naturally be either in the desert or at Suez, and it would be necessary to carry their supplies to those places; now, though heavy *Belladee* Camels may carry 200 okes of tibne, it is fair to calculate that three of the Bedouin Camels will not take more than 384 okes, or the day's supply. Thus $3 \times 30 =$ p. $90 \times 300 =$ p. 27,000, as expense of carriage.

Forty-eight, or $\frac{2}{5}$ of the horses being at Suez, or near the Nile, may be supplied with water at an expense which need not enter into calculation; but seventy-two, or $\frac{3}{5}$, being in the desert, will require (unless boring or other means should supply new sources) that water should be conveyed to them. Allowing for a little wastage, but on the other hand using the most serviceable (cow) skins, each horse will require a quarter of a Camel-load a day. Thus $18 \times 30 = 540 \times 300 =$ p. 1,62,000.

It is indispensable that horses in this climate should be turned out, say for sixty-five days, to *Berseem* or clover. Each horse is allowed half a feddan, and taking it at about the cost of the present year, p. 400 (which happens to be unusually low) we have $60 \times 400 =$

p. 24,000, to which we must add the expense of *rafeeahs* or guards, six of which, in addition to the ordinary attendants, will suffice to protect the animals from robbery. Estimating each at p. 100= $100 \times 6 =$ p. 600.

For the management of the five stables there would be required one Nazir, or a general Superintendent, at p. 300 a month, five chief *Saises*, resident at the several stations, at p. 100; and ten stable assistants, at p. 60 each. In addition to these, I calculate that each set of four horses would require one good groom, to be always with them; and as much of his time must be passed in the desert, the monthly wages of each cannot be estimated at less than p. 80. The total annual expense for these men will be p. 38,400.

The horses will require shoeing at least once in 30 working days, and supposing that this is done by contract, each set of *shoes* (Arab) will cost p. 6. Thus $120 \times 6 =$ p. 720 a month, or in the year, p. 7,200. To meet veterinary, and minor charges, I add p. 2,200.

Summary.

| | paras. |
|------------------------------------------------------------------------------|----------|
| Cost of 2,250 ardebs of Barley at p. 40, | 90,000 |
| Carriage of $\frac{4}{5}$ of do to Suez and other stations, | 27,000 |
| Cost of cut straw (tibne),... .. | 14,400 |
| Carriage of $\frac{4}{5}$ of do. to Suez and other stations, | 27,000 |
| Carriage of water for 72 horses to do. | 1,62,000 |
| 60 Feddans Berseem, | 24,000 |
| 6 Rafeeahs or guards, 65 days, | 600 |
| 1 Nazir, or general Superintendent of horses, at p. 300 a } month, | 3,600 |
| 5 Superintendent <i>Saises</i> at p. 100 do. | 6,000 |
| 30 Grooms, or <i>Saises</i> , p. 80 do. | 28,800 |
| 10 Stable Assistants, p. 60 do. | 7,200 |
| Shoeing 120 horses, at p. 6 each, | 7,200 |
| Veterinary and minor expenses, say, | 2,200 |
| | <hr/> |
| | 4,00,000 |

In the above calculation, nothing is put down for the wages of English carters—the wear and tear in harness and stable gear—the expense of water skins, which must be very great—the interest on outlay—or the loss in cattle.

But we may now calculate what work can be done with 120 horses, kept at an annual expense of p. 4,00,000. It has been already observed, that the animals are available for only about ten months of the

year; and I consider, that, with due allowance for rest, each set of twelve horses can make only one journey to Suez and back in ten days; in other words, thirty vans might proceed to that place and return every month, for ten months of the year. In the estimate it is stated, that each van will convey 15 tons admeasurement, the heaviest horses, however, would have great difficulty in dragging forty sacks of coal, or five tons, weight;—thus $5 \times 30 = 150 \times 10 = 1,500$ tons in the year; supposing even that there were 1,500 tons of goods to return from Suez, the expense per ton, merely reckoning the keep of and attendance on the horses, would be each way p. 133 $\frac{13}{40}$, more in fact than that of Bedouin Camel-hire for the same amount; coals being now sent to Suez for p. 132, and goods returning from there, at from p. 80 to 100.

Much misunderstanding appears to exist as to the nature of the Suez road, which will be found on examination to be by no means adapted to heavy waggons, although there is nothing to interfere materially with the transit of light carriages; always excepting the expense of horses, in a climate in which they cannot do half the work that they would in Europe. The first part of the road, for about ten miles, is in reality a deep sand, which would require very broad wheels to pass over; the rest is, with a few exceptions of sandy intervals, a tolerably compact gravel. I should suppose much of the road would be cut up by only a few months passage of heavy vehicles, and that with little or no chance of repair, so far as the Egyptian authorities are concerned. The want of water on the road adds enormously to the expense of transit where any other animals than Camels are used, and though it is possible, but from the geological formation not very *probable*, that boring may succeed on some points; it must not be forgotten that experiments have already been made, (see Transactions of Geographical Society) and without any permanently useful result. In Mr. Holme's Report, pp. 121-122, this matter is however treated very lightly. Mr. H. says, "another objection has been made, that there is no water between Cairo and Suez; if this had to be carried, as it now is, for the supply of the cattle, &c. it would amount to a small addition in the cost of transit, that is all; but it can be shown from analogy that good water could be found by boring at any point on *this* line, and at about depth; and were this not the case, or did it present a greater difficulty, 25,000*l.* or 26,000*l.* would lay down a pipe, the whole distance; and consequently provide a *self-acting supply* from the Nile at any point where a plug might be fixed." Mr. H. writing at a distance from this country, seems not to have been aware that the principal level of the desert is more than sixty feet above the surface of the Nile, during the period of

inundation, and that several parts of the road are *still* higher. However convenient therefore this self-acting supply may appear on paper, we who are on the spot know very well, that the expense would not by any means be confined to so many miles of iron pipe, but that to raise the water to the requisite height, there would be a considerable outlay for a steam engine, raised tank, &c., &c. in addition to which there is nothing to prevent the pipe being injured or destroyed in any part of the road, whenever the Bedouins should wish to impede the carriage transit, on which they cannot look *with* very favourable eyes, depriving them, as it would do in great measure, of the means of existence. Reflecting upon the subject of transit across the isthmus, I cannot too strongly urge on you the necessity of abandoning the van scheme, so far at least as the carriage of coal and heavy goods is concerned. Till such time as enterprise may have re-opened the ancient canal, or laid down a rail road, I would advise you to use the means which this country places at your disposal. Should the demands of the Egyptian Government, as I think is very probable, so far engross the Bedouin Camels as to prevent your hiring a sufficient supply, it will I believe be in your power to find persons in Egypt ready to purchase, keep, and furnish by contract, a sufficient number of heavy Camels, to carry across any quantity of coal you may require, at about the present cost, as estimated in my report. The following sketch will however shew, approximatively, what would be the expense to a Company, keeping its own animals, in order to have a regular and certain supply entirely at its own disposal.

Three hundred heavy camels, to be kept in good condition, will require, at the rate of a roob each, 300 roobs of beans daily, or say 300 days of the year, or 3,750 ardebs. The variation of prices has been so great in the last few years, that it is difficult to estimate the average, but I put it down as double the cost of barley, which I reckoned at p. 40 the ardeb, $3,750 \times 80$ p. 300,000.

Taking into calculation, that when crossing the desert Camels brouse by preference on the prickly plants and shrubs which abound along the whole line of road, I estimate the quantity that will be required of cut straw (*tibne*) at 600,000 okes, which, at 4 paras the oke, will cost p. 60,000. Each animal carries his own provisions, so that there is no extra expense upon this head, as in the case of horses.

For the above number of Camels at the rate of $\frac{2}{3}$ a fedden each, 200 feddens of Berseem will be required, which at p. 400 will cost p. 80,000. During sixty-five days, 10 *rafeeahs* or guards must be employed, at p. 100 each, 10×100 p. 1,000.

To take charge of the Camels I allow one *Nazir*, or general superintendent, at p. 300 a month; 3 *mukuddems* at p. 100 each; and 60 Camel men at p. 60—making an annual outlay in wages, of p. 50,400, to which must be added two men to mend the saddles, &c., at p. 70, or for the year, p. 1,680.

Summary.

| | paras, |
|-------------------------------------------------|---------|
| Cost of 3,750 ardebs of beans, at p. 80, | 300,000 |
| Do. Tibne, | 60,000 |
| Do. 200 feddens of Berseem, at p. 400, | 80,000 |
| 10 <i>Rafeeahs</i> , (guards) at p. 100, | 1,000 |
| 1 <i>Nazir</i> , at p. 300 a month, | 3,600 |
| 3 <i>Makuddems</i> , at p. 100 do. | 3,600 |
| 60 Camel men, at p. 60 do. | 43,200 |
| Veterinary and incidental expenses, say, | 4,600 |
| | <hr/> |
| | 496,000 |

Not to overwork the Camels, I should allow ten days for the journey to Suez and back again, the animals being loaded each way, and carrying a quarter of a ton each. In the three trips per month, they would convey 250-tons of coal to Suez, and working only 300 days of the year, would place at the depôt there 2,500 tons, being available to bring back a similar weight of goods from Suez. Calculating the carriage of the former at p. 132 the ton, the latter would be about p. $73\frac{18}{40}$.

The great advantage in an establishment of this kind would be the regularity with which the coals might be transmitted to Suez; and as the departure and arrival of the caravans would be entirely subject to the Company's arrangements, all the packages landed from the steamer at Suez, might be immediately brought across the desert, and proceed without loss of time to their destination.

Any one who has long resided in this country, and has had opportunities of comparing the relative cost and utility of Horses and Camels; will have no hesitation in deciding in favor of the latter. The Camel is a most hardy animal, carries its supply of water in its stomach and its beans upon its back, browses on prickly shrubs no other animal can touch, and does not ever require a shade or covering to its resting place. These are qualities which even the English horse most certainly does not possess, and if ever the communication between Cairo and Suez is to be made by vans, it is the Camel and not the horse, or even the mule, that must be harnessed to them.

In the event of a Company requiring a Camel establishment of their own, the agents must not be allowed to purchase the village Camels that are to be found in the neighbourhood of Cairo. Such animals, although very heavy, appear to have lost somewhat of their natural habits, and to be less fitted for the desert than those of the Bedouin breed. It would be necessary to send persons of competent knowledge to the Bisharee desert or the Sennaar, where Camels are good, plentiful, and cheap. Some losses in bringing them down would be unavoidable, and it is but safe to calculate a good stud of well chosen, strong, heavy Camels as averaging not less than 15*l.* a head

(Signed) ALFRED S. WALNE.

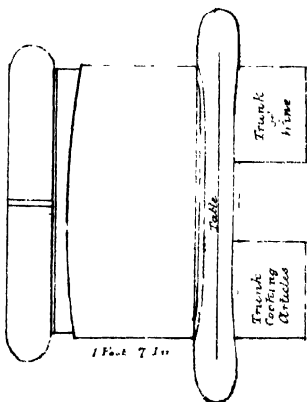
*Memorandum on Camel Draught and Harness. By Captain TAYLOR,
late Agent for Post Office Inquiries.*

The recent discovery of the efficiency of the Camel in draught, is a point of singular moment in respect to overland communication. Mr. Bird, the able and intelligent senior member of the Board of Revenue at Allahabad, has recently made the tour of Upper India in a carriage drawn by two, three, or four Camels, as circumstances rendered their power necessary. The more usual number in harness, was three. The carriage was a light britska on four wheels, each of five feet diameter, with a dickey fore and aft, and a well for baggage. The carriage conveyed Mr. Bird and his lady, and four servants, and baggage consisting of beds, tables, portable chairs, crockery, cooking utensils, wines, &c., and clothes, writing apparatus, and official documents. They travelled at from thirty-six to forty miles per day, going half the above distance in the morning, and half in the afternoon. Either half was usually performed in from three to four hours; the pace averaging about six miles per hour, when the road was good; and about four and a half, or five miles per hour, when the road was indifferent. In deep sand, the pace would of course be less; but in sand, such as the desert is represented between Suez and Cairo, I should think five miles per hour might be easily obtained. I made some experiments myself while in Upper India, in respect to the Camel in draught, which I here take the opportunity to mention.

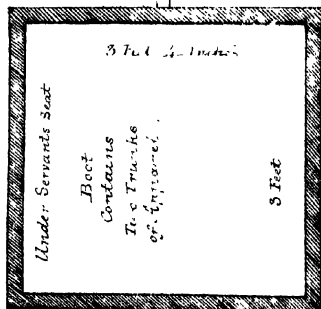
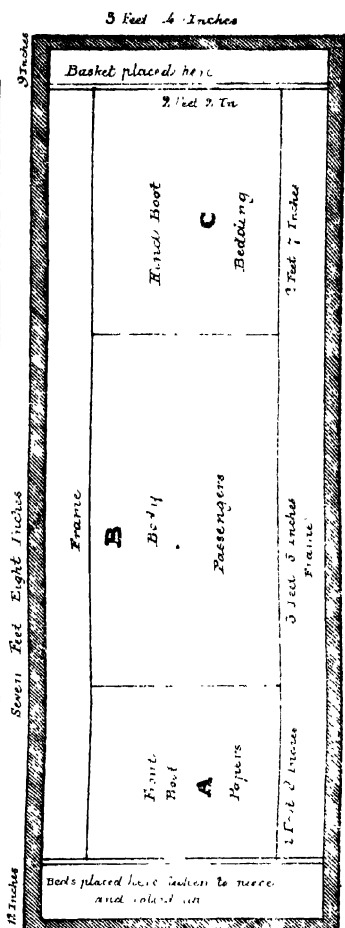
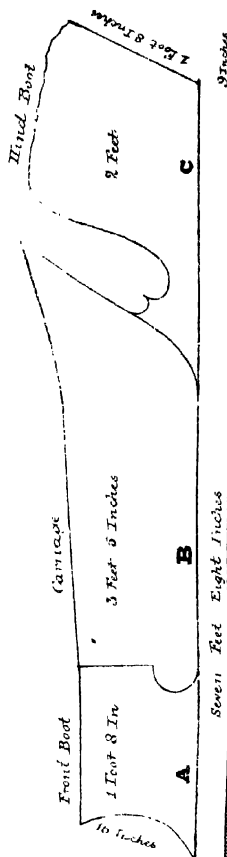
First, in respect to conveyance of baggage. Secondly, in respect to conveyance of men.

A small frame composed of strong bamboos was placed on a pair of wheels, and balanced much in the same manner as the ekkas in the North-West Provinces. On this was placed a large stout tin box,

Servants Seat



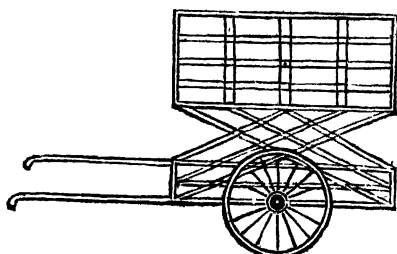
Plan and Location of the BODY and FRAME and SECOND FRONT BOOT of the CAMEL CARRIAGE belonging to R. M. Bond Esq. etc.



2nd Front Boot

5 Feet 4 Inches

in a wooden frame, four feet square by two and a half high. A Camel was then brought, equipped just as a common Huckaree Camel, but having a small loop on either side of the saddle, into which the hook of the shafts was passed.



The Camel was mounted, and

in lieu of putting baggage into the van, we put four men and started it. The Camel moved away with it at the rate of full six and a half miles an hour, and trotted gaily all round the stony and uneven surface of a large compound. We then proceeded some distance along the road, and the Camel van was found to answer admirably.

The next day we tried a four wheel conveyance for passengers. It was a light carriage, something between a palanquin carriage and a double bodied coach, with rattan-work blinds, which let up and down, and excluded the glare, while they let in the breeze. It had a small dickey in front, and afforded excellent accommodation for two persons and their servants, and a couple of carpet bags, and minor &cs. To this we harnessed two Camels, the pole being attached to one side of each saddle, and a bamboo trace being fastened to the other side. The Camels were mounted, and Dr. Ranken—the ingenious inventor, and prime mover of the whole—and myself being seated inside, and a servant on the dickey, we started, and drove half round the city walls of Delhi, then entered the gate and drove through the Chandrichouk; to the no small surprise of the natives: our pace being somewhat more than seven miles an hour. We returned home after a drive of some six or seven miles. The next evening a second experiment was made. Three miles were measured from the Cashmere gate. The road was mostly good and smooth, but by no means level, the load about thirty stone; the carriage started, and completed the entire three miles out, and three miles back, total six miles, in thirty-eight minutes;—nine and a half miles per hour.

Again I left Delhi en route to Allyghur, and after crossing the river, started in the above mentioned carriage with two Camels for Dadree, distant twenty-two miles. The first eighteen miles were certainly as rough a road as I ever remember to have passed in a wheel conveyance, and in places indeed was so bad, that I was compelled to quit the road, and drive through the fields. The last four miles were good. The whole distance was performed in four hours and twenty minutes,

including a detention of about ten minutes in crossing the Hindon river.

When the Camel's temper, docility, strength, and capacity to endure thirst, are considered, it must be obvious that no mode of crossing the desert could be discovered, equal to that of a Camel carriage.

The best description of carriage for the purpose, would probably be something between a britska and a cab phaeton, made as light as possible, with hood that will let down or close up entirely, and with dickies for servants before and behind, and room in the body, or under the dickies, for clothes and other baggage. On a good road such carriage should of course be made with steel springs, but for crossing rough roads, I should think, that long springs of buffalo leather, like those used for the Caracollas in the Havannah, described in Alexander's travels, would answer well. The wheels should be all of the same size, and five feet in diameter. I should think that carriages of the sort required, might be built both cheaper and better in India than in Europe. Calcutta built carriages are usually lighter than those imported, and the wheels are especially much lighter, and certainly stand the climate better. I have reason to believe that for 1,500 or 1,600 rupees, a carriage of the above description, every way efficient, may be built in Calcutta.

Three Camels per stage would be ample for such carriage, to take two passengers, their servants, and light baggage; and the distance from Suez to Cairo being under eighty miles, four stages would suffice. Three relays would be necessary, and the journey might then be performed with safety and ease in twelve hours. These relays might be sent forward from Suez, when the steamer was first signalized, and would then be ready to take forward the carriage, when the traveller reached the relay station.

The Camel draws with perfect ease, and requires but little training. His pace is a long walk, or a long trot, and there is no unpleasant motion of any sort imparted to the carriage by his movement. It is not generally advisable to take a Camel in draught a longer stage than twenty miles, as when over-worked they are apt to lie down, and will not move; an unpleasant proceeding in mid-stage. But for eighteen miles they will trot readily and well. Camels for draught should be highly fed, and it is a good plan, at the expiration of a stage, to give them half a seer of ghee; this if laid out in skins, they will lap up at once, and will then readily eat their grain or fodder; but otherwise, they will sometimes be off their food; and it cannot be too strongly impressed on all who employ the Camel in draught, that good feeding is a *sine quâ non* to ensure its efficiency.

The Camel men generally have a prejudice against employing Camels in draught. They say that the Camel was never intended to draw, but to carry, and look upon it as little less than a sin to put the animal into harness. They have further a prejudice, that it will kill the Camel: this is altogether fallacious. On a plain, the Camel draws with extraordinary ease, and a single Camel is fully equal to two and a half horses. It is not however so easy to combine Camel labour, as it is that of horses, i. e., it is less easy to make them pull quite steadily together; and four Camels are not equivalent to ten horses; I should estimate their power rather that of seven or eight horses. They do not draw very well up hill.

In India, the Rewarree Camels draw with the least training, because they are accustomed, in their own country, to draw the plough; and I should think the Egyptian Dromedary would draw equally well, for I think I remember to have read in some book of travels, that in Upper Egypt they are occasionally harnessed to the ferry boats.

The carriage should be built as light as is consistent with the union of strength and comfort, for it is far preferable to have a light carriage drawn by two Camels, than to have a heavy carriage with four Camels.

The Camel will draw a buggy well, but the buggy should be so balanced, like the ekkas, that but little weight may rest on the animal; and it must be borne in mind, that in consequence of the Camel's height, the shafts must necessarily have a considerable inclination upwards.

The bridle and saddle required for the Camel in draught, are precisely the same as those used for the common Sandees or Hurkaruh Camels of Upper India. On each side of the saddle however, and a little behind the legs of the rider, is an iron ring into which the hooks of the traces are looped. Around the neck of a Camel is a sort of breast-plate of broad tape or rope, which serves to keep the saddle steady in its position.

The traces are of male bamboo, with a hook at one end to hook into the ring on the saddle, and on the other a loop, like those of a leathern trace, to loop on to the carriage.

The Camels are harnessed in pairs. There is a pole like that used for horses, but its position is more upright, and which is buckled to the saddle, as it would be to the harness of a horse.

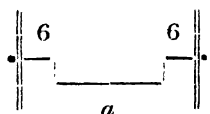
When four Camels, or three Camels are used, splinter bars are put on the top of the pole, and the front Camels are harnessed to them by traces in the same manner as the wheel Camels. Each Camel has a separate rider.

T. J. TAYLOR.

CALCUTTA, April 15th, 1839.

Extracts from Mr. WALNE'S letter of 15th June, 1839.—Dromedary Carriages.

I now proceed to the question of Dromedary carriages. My attention has for sometime been seriously turned to this subject, and though observation has quite convinced me that the Camel is a most useful animal for draught, and may be turned to great account in taking across the desert trucks loaded with coals, and other heavy articles, I have hitherto felt rather less sanguine as to adapting Dromedaries (i. e. light Camels) to vehicles calculated to combine comfort with expedition. The difficulty attaches principally to the carriage, and the peculiar road over which it has to pass, and is one, after all, which will doubtless be overcome by the ingenuity of the coach maker. Though a considerable portion of the Suez desert is a hard gravelly plain, there are here and there broad bands of deep sand, over which an ordinary carriage cannot readily pass, whilst in other spots the road is so strong and rough as to defy the best springs, and put ease out of the question. It is, in short, as nature has made it; and though art may do something to improve its condition, this line can never acquire the properties of a good carriage road. To overcome these obstacles it is necessary that the wheels should have a much greater diameter than those usually employed, and in my proposals forwarded by the last steamer to the Honorable Court of Directors. I suggested, for the conveyance of coals a truck, or cart, with two wheels of nine feet diameter, the weight being suspended from the axle, and the pole resting by a bar on the necks of two Camels. A carriage however for the conveyance of passengers, obviously requires four wheels, and as their diameter must be not less than six feet, and should if possible be more, the whole vehicle will be apt to acquire rather an unwieldy form. The height however of the body from the ground may be diminished (though a little at the expense of strength) by giving a dip or bend *a* to the axles



which, as well as the wheels, must be of wrought iron, and by placing the suspension (not curriele) springs at the sides, 6 6. The pole must be adapted not only to the height of Dromedaries as they stand, but also to their habit of occasion-

ally lying down, and the draught be on the hump and ribs of the animals, the harness being similar to that of Major Pew's Artillery. The body should of course be as light as is consistent with the requisite strength, have good arrangements for ventilation, and might contain comfortable sitting room for eight persons, four inside, and two in a cabriolet division at either end. For a carriage of this kind, four Dromedaries will be necessary, and the journey being divided into four stages, each ve-

hicle will require 16 animals. Taking the calculation at 13 carriages and 208 Dromedaries, the following will be the annual expense of the latter, reckoning beans at p. 60 the ardeb.

| | | | | | |
|-------------------------------|-----|-----|--------|-----|-----------------|
| 2,600 ardebs of beans, at 60, | ... | ... | ... | p. | 156,000 |
| 374,400 Okes cut straw, | ... | ... | ... | „ | 37,440 |
| 104 Feddans Berseem,... | .. | ... | 41,600 | | |
| Rafeeahs, | ... | ... | ... | ... | 1,000 |
| | | | | „ | 42,600 |
| 52 Boys, at 35 p. month, | ... | ... | ... | „ | 22,560 |
| 20 Men, at 60 ditto, | ... | ... | ... | „ | 15,120 |
| 1 Nazir, at 300,... | ... | ... | ... | „ | 3,600 |
| Incidental expenses, say, | ... | ... | ... | „ | 2,680 |
| | | | | | <hr/> |
| | | | | | 280,000 £ 2,800 |

To render the Dromedaries serviceable for bringing passengers from Suez, as well as conveying them to that place, it is requisite to add 52 Dromedaries (increasing the annual expense one fourth,) to be placed at the Suez station, at the same time doubling the number of carriages. The latter would, at each end of the journey, await the arrival of the following steamer, but for the intermediate time the animals should be withdrawn from the stations to the neighbourhood of Cairo, where alone they could be fed with economy, and be properly looked after.

For both mules and dromedaries there must be some expense attending the carriage of beans to Suez, and there may also be an occasional outlay for water at the stations in the desert. In the event of the former being employed, each mule would, on ordinary occasions, carry a bag of beans and a small *gurbah* of water, sufficient for the 30 hours passed in the desert; and if carriages be adopted, the dromedaries sent forward for relays will take with them a quantity of beans and straw sufficient for the journey. In either case the detention of the animals at Suez should be as short as possible, not only on account of the great additional expense of feeding them there, but the bad condition which is apt to result from the continued use of brackish water.

In the above estimates I have only calculated the number of animals, whether mules or dromedaries, required for the transit of 100 passengers, but I need not observe that to provide for casualties a larger establishment would be required. The clover season too, in which the whole stud must be turned out, will give rise to some inconvenience, that must be anticipated and provided for.

It will have been seen, by a comparison of the two estimates, that in the annual expense of keeping mules for sedans, and dromedaries for

carriages, there is no very material difference. The speed will, I consider be nearly equal, and I question if in either mode the actual journey be in general performed in less than eighteen hours. Even in carriages I presume the travellers, particularly ladies, would gladly avail themselves of ten or twelve hours rest at the stations, and as the departure of the steamer must be regulated by the arrival of the cargo and baggage, no advantage would be gained by compelling passengers to hurry through a journey, that must, under the most favourable circumstances, be sufficiently fatiguing. As however the advantages and disadvantages of either scheme can only be judged of by experience, the best advice I can give the Committee is to direct comparative experiments on the *actual road*, to be made and reported on a rough carriage, that might afterwards serve as a break; and a sedan frame, four dromedaries and two mules, are all that would be required, and a series of trials made for a few weeks, and at a trifling outlay, would set the question at rest, and enable the Committee to adopt a plan that need not entail the expense of subsequent alterations.

The freight of coal from Alexandria to Cairo is, in native boats, 6 a ton, and the landing, stowing, and subsequent transfer to the steamer, will cost about one more. The latter charge is the mere cost of Arab labour, and is distinct from the annual expense of a clerk, weigher, gate-keepers, &c., which, with proper management, might be serviceable in the baggage and cargo department, as well as in the coal depôt, provided the latter be limited to the supply of the Nile steamers. In the event however of there being a depôt, on a large scale, connected with the transfer of coals to Suez, the establishment should be entirely separate.

If by employing large steamers coaled at Aden, the depôt at Suez can be dispensed with, doubtless there will be a great advantage to the Company in such an arrangement. The business of the Egyptian Agency, already sufficiently comprehensive, will be proportionately lighter, and probably a great annual expense will be avoided.

In my letter to Mr. Greenlaw, dated 17th December, I offered an estimate of the expense of delivering coal, which was at that time from Alexandria to Suez about 2*l.* a ton. A recent rise in Camel hire has added nearly 10 per cent. to the cost as then calculated; so that the carriage of coals by hired Camels, particularly where so large a quantity as 10,000 tons is required, has less to recommend it than formerly. An immense saving may however be effected by the adoption of the Camel suspension truck, to which I have already alluded, and I calculate that coal may be put on board at Suez for about 1*l.* 13*s.*, exclusive of the cost of delivery by contract (at present 2*l.*.) at Alexandria. The

plans and estimates connected with this subject are now before the Honorable Court of Directors, and I leave it to the Committee to use their influence, in obtaining from that source, the information I have communicated, and which is I believe of sufficient interest to merit their attention.

(Signed) ALFRED S. WALNE.

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*Her Majesty's Vice-Consulate, Cairo, 5th July, 1839.*

SIR,—I have the honor to acknowledge receipt of your letter of the 29th April, containing copy of a paper on Camel carriages, communicated by Mr. T. J. Taylor to the Committee of the New Bengal Steam Fund.

In my letter to Capt. Barber, of which the above is a copy, I have entered somewhat at length into the question of Dromedary carriages, and before the departure of the next English Steamer, I shall, in compliance with your request, send him a few observations on Mr. Taylor's excellent paper, the perusal of which has interested me much, and afforded me some hints that may prove extremely useful.

I am sorry that I cannot forward you a copy of my proposals for the carriage of coals, in high wheeled carts, drawn by Camels; but having caused them to be laid before the Court of Directors, I thought it best to limit myself to advising Capt. Barber as to the source from which he could obtain the information I had furnished.

I was enabled to obtain from Capt. Graham, who accompanied the elephants to Cairo, a general idea of Major Pew's Camel Artillery, but if the Committee would do me the favor to furnish me with a sketch of the harness in detail, I should feel particularly obliged.

(Signed) ALFRED S. WALNE.

C. B. GREENLAW, Esq.

*Sec. N. B. S. Fund.*

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ART. VII.—*Account of a Journey from Sumbulpúr to Mednipúr, through the Forests of Orissa.* By LIEUT. M. KITTOE.

(Continued from page 480.)

May 28th. I resumed my march at half-past 2 A. M.; the morning was very clear, and sufficiently light for me to see as much as was necessary after my observations the previous evening.

I had almost forgotten to mention, that yesterday evening a very intelligent person from Lehra had given me a good deal of information, which, if quite correct, would be very valuable. Having learnt from me the ghat I was proceeding to in the Keunjur hills, he told me that I had come much too far south, that I ought to have continued due east from Sonamoonda, where I had turned southward, and have crossed the river at Barakôt, a place at the foot of the hills between which it flows by a very narrow pass, and that from thence to the mountain chain, the path was direct and tolerably good; he added, that it led to a pass that had not yet been examined, and which is in a very good direction.

In consequence of this information I determined to regain the proper line by avoiding Lehra, and proceeding direct to a place called Goorsunk, distant fourteen and a quarter miles. On first starting I went through the village and then descended into the bed of the river, which I crossed in a direction slightly diagonal, passing over several islands; the distance across was half a mile. The gravel in the river's bed consists chiefly of granite, gneiss, quartz, and much jasper of variegated colors. I could not discover the slightest trace of coal, so that I feel the more positive of the correctness of a former conjecture of mine, that the coal measures are confined to the country below the gneiss and granite formation, extending along the northern boundary of Táleher, Ungool, and Rehrakól.

Having reached the opposite bank I travelled in a north-easterly direction over tracts of very rich soil, with an equal proportion of jungle and cultivation, till I reached a large village amidst beautiful mango topes, called Hunnaum, distant one and a quarter miles from Barsing; from hence to another respectable place called Bumpúra, nine miles further on. I passed through a thin forest of saul with occasional patches of cultivation, the path inclining more to the eastward than before; the soil is exceedingly rich, consequently the heavy rain of the previous evening had rendered the road very muddy and difficult to travel over; in this there was one advantage, for it shewed the necessity of metal-ling, should the road pass this way. It is really lamentable to see such fine lands left uncultivated.

Three miles and seven furlongs beyond Bumpúra, I reached my encamping ground at Goorsunk; most of the huts in the village were falling to ruins, one third of the population having perished from famine and cholera the previous year; it is situated at the entrance of a narrow pass between two low ranges of hills, and is surrounded with fine topes, in one of which I spread my carpets and made myself snug for the day.

While passing through the forest a peculiar sound attracted my attention, it was like that of a wooden ball dropped on a board and allowed to vibrate; I at first thought it might be a woodpecker, as it proceeded from the top of a lofty and withered tree, but upon inquiry I was told that it was a kind of frog which inhabited the trees (the tree frog?) and that its call was a sure harbinger of rain;* it is considered venomous, indeed that its bite is certain death. I regret that I could not obtain a specimen; its color is said to be 'dark with white spots. At this place I remarked a number of stones placed in the same manner as the druidical monuments (such as the Kitscotty house near Boxley in Kent) viz.. three set upright, with one on the top of them, the dimensions of these are however very small, and have the appearance of a number of three legged stools. A custom prevails in these parts, of relatives collecting the ashes and bones of the deceased, and after burying them, placing stones over the spots in the manner above described.

Before my arrival the male part of the small population had fled to the jungles, leaving their better halves to protect themselves and property as they best could. It is a common practice throughout these provinces; the instant strangers are perceived, off the people run (as if their lives were at stake) and are hid in the depths of the jungle in a moment,—it is to facilitate their escape that the jungle is never entirely cleared near the villages; a narrow belt connected with the forest is usually to be found. I forbade my followers leaving camp in order to prevent pilfering; the villagers returned towards the afternoon, and crowded round me to see what description of being the Sahib was, never having beheld a white man before.

The view from Goorsunk is very confined, the place being situated in a hollow; to the eastward rise the Keunjur mountains over which I was to pass, they appear to be near 2,000 feet, and are thickly studded with trees. To the southward the Malagir mountain is distinctly visible above

* I have since heard many, and am inclined to think that these reptiles do not call except on the near approach of and during wet weather, as I have never heard them at any other time.—M. K.

the range of low hills; this mountain is reckoned the highest in Orissa; the people assert that there is frost ("pala") on its summit all the year round, and that the cold in the winter months is very great; the latter assertion I can easily credit, for it cannot be less than 4,000 feet above the level of the sea, perhaps more. I hope at some future period to be able to measure its height, and to learn more concerning it, for if all accounts be true, it would be a delightful and salubrious locality for the residence of any European functionary appointed to preside over these ill-governed and ill-fated states. There is a "guruh" or stockade on a shelf of land two-thirds of the way up the mountain on its northern face; there is said to be a fine tank and beautiful groves of orange* and other fruit trees; the position is considered very strong, and has for many years been resorted to as the place of refuge, (in case of attack) of the Lehrapal Zemindar. The estate of Lehra was formerly one of the eighteen dependencies of Sumbulpúr, as I have before said; but some years ago, the uncle of the present Zemindar willed his estate to the Keunjur Raja, or rather gave it to him as a dowry on the marriage of his daughter (an only child.) This questionable act has led, as may well be supposed, to continual feuds between the two powers, the Zemindar refusing to pay the homage required by the Keunjur Raja, and the latter refusing to accept the tribute (which amounts to 250 Rupees per annum) unless the former consents to attend once a year at the Keunjur durbar, and there present a nuzzur together with his tribute, dressed in woman's attire, i. e. a Sarí and Chúrís (bangles) on his arms, and in this condition prostrate himself at the Raja's feet. This the Lehra chief has from the first refused to do.

It is said that the former Rajas of Lehra used to hold their estate on this particular tenure from the Rajas of Sumbulpúr, but that the practice had long since been discontinued. Most of the minor "gurhs" were originally held on the like curious tenures, and some even still more absurd, for instance the adjacent state of Rehrakól; the Zemindar used to perform (once a year) what was termed the "Muggur loth" or alligator's roll, when attending with his tribute on his lord (Sumbulpúr). The ceremony is thus described:—the Zemindar besmeared himself with mud, and when arrived within a stipulated distance he had to lie down and roll along the ground in that condition to the Raja's feet, which he saluted, his nuzzur was then accepted and he was allowed to rise.

In consequence of the above mentioned difference between the

* The states of Talcher, Rehrakól, and Lehra are famous for oranges of a small size, but very sweet.

Lehra and Keunjur Rajas, the former sent two trustworthy persons to confer with me on the subject; I listened to their story, but as I had no power to interfere I declined giving any advice, except enjoining them to keep the peace, which I was informed the latter wished to disturb.

I learnt the following from the vakeels—the difference between the two states had existed for many years; at first Colonel Gilbert (the Governor General's Agent) visited Lehra to inquire into the case, he directed the Keunjur Raja to remove his paik thannas out of Lehra until the dispute between the parties was amicably adjusted; up to that period the tribute had been paid to Sumbulpūr, but since then the Lehra man had regularly offered it to him of Keunjur, who has invariably refused to receive it unless the former consents to perform the degrading ceremony.

The tribute has been regularly placed in the treasury of Lehra, and has consequently accumulated to some thousands of rupees, which the Zemindar said he was willing to pay either to Keunjur or to the British Government, but will sooner forfeit his life than humble himself as required; * the vakeels said that the Commissioner of Cuttack had refused to accept the tribute, and had ordered their master to submit to Keunjur, they added that they would do any thing I would order short of the degradation required.

This case shews perhaps the necessity of the political officers occasionally visiting the different mehaults; much good would result from it in various ways; but such is the multiplicity of duty which they are at present saddled with, that they have but barely time to attend to the more immediate and urgent duties of the country under our own regulations; added to which the stations of the two (present) authorities, viz. the Governor General's Agent, south-west frontier at Kishenpūr near Hazaribaug, and the Commissioner at Cuttack, are both upwards of one hundred miles removed.

Having dismissed the Lehra people, with promises that I would try and get the Keunjur Raja to come to amicable terms, (if I met him) also to speak to the Commissioner, I proceeded to give the Deogurh Mooktar his "rooksut" as I was now no longer in his district; he complained loudly of the extortions and oppressive conduct of some of the people who had attended on Capt. Abbott, and myself,

* In January of the present year when at Jotepur in Keunjur, I was informed that the Raja was preparing for an attack on Lehra, having erroneously supposed that Mr. B.—, the Commissioner, sanctioned his so doing; and I was assured that my presence only had induced them to suspend hostilities which they intended to re-commence when I should have left.

I took down his deposition in writing and determined to report their conduct, which I did subsequently;* a further complaint was made of the oppressive conduct of one of the postmaster's jemadars, who had been extorting money, right and left, under false pretences of having been ordered to take the road first through one place then another; this individual had however lately been severely punished and discharged by Mr. B. who had heard of some of his pranks.

Being informed that the road in advance was very difficult and rugged, I thought it prudent not to push on in the evening as I had at first intended, so I passed the night at Goorsunk.

May 29th. Started this morning at half-past three and reached Tungoora at the top of the ghat at 10 A. M. after a most fatiguing march up and down hill for twelve and a half miles (by my perambulator) but by a previous measurement made by one of Mr. B——'s people it was much less,† the whole ascent being only 1,800 feet in all. This must however be an error, as the least, actual height of Tungoora above Goorsunk must be from 1,800 to 2,000 feet; the difference of atmosphere and of the range of the thermometer clearly indicates it; the latter was ten degrees below the range at Barsing and Goorsunk, and it must I should think be at least fifteen degrees below the usual range in the country below. The Malagir mountain (which is seen in all its grandeur from hence) appears to be considerably higher, therefore the thermometer at the hottest season ranges perhaps at six or eight degrees less still, which would make it a desirable spot for a sanatorium.

The road from Goorsunk as far as the village of Mandarah—six miles and a quarter—has a direction slightly northerly; there are many small watercourses and much uneven ground, also two large nullas over which rope bridges would be requisite, but it appeared to me that a much more favorable line could be laid down and innumerable windings avoided, also many watercourses. From Mandarah the bearing of the valley from which the ghats (viz. Tungoora and Muttighatti) branch off is 60° south; I proceeded up the elevated ground in the centre of this valley, till a little beyond the village of Rungaree, at five miles and six furlongs I crossed a deep nulla and turning due north entered a narrow branch valley with a water-course down its centre, at this spot the path to the Muttighatti

* Major W—. I believe attempted to inquire into this matter, but was unable to gather the witnesses; these people would sacrifice any thing rather than leave their homes and venture before our cutcheries, however kind the European officer.

† I subsequently found that I had been led by another path the worst of all.

continued in a south-east direction. At seven miles and one furlong I reached the first perceptible ascent, and at nine miles and one furlong reached the top of the first ghat which was tolerably steep, much more so than necessary, as were the path to have an even ascent it would be less fatiguing, but at its best it would be difficult for wheeled carriages; the path runs along the edges of the watercourse, crossing occasionally from side to side, beyond this there is much gentle ascent over good ground; the second, third, and fourth ascents are very steep, but of no great duration, there are also several descents. If this ghat be adopted, the path must be judiciously managed so as to wind down by the edges of the watercourses; the greatest obstacle is the rocky nature of four out of five of the ascents, and of three-fourths of the whole distance; the stones could be thrown aside, but such as could not be removed could also scarcely be blasted, as the rock is of the hardest quartz and granite; they might perhaps be broken with sledge hammers and wedges.

Nature offers a capital hint for protecting the inclined surfaces of roads in the hilly tracts from being washed away and cut into furrows, and in many instances completely destroyed,—it is the effect produced by those trees which have fallen athwart the paths, likewise parallel to them; at these spots there are regular steps formed (as it were) and the intermediate spaces are quite level; whenever I have passed over undulating lands (which are as ten to one) I have observed that paths are less cut up and much better when there are fallen trees.

The hills have a superstratum of stiff red marl, and many are cultivated to the very peaks;* it has a lively appearance and bespeaks industry, for great labour must be bestowed in clearing these lands.

Tungoora is a large village surrounded with plantain gardens, it is in the Lehra zemindaree, and is supplied with good water from two strong springs flowing down both to the north and south sides of the hill, several hundred feet below. The view from hence is very grand but confined, owing to the trees.

The jungle on this morning's march was the same as usual, rather scanty but the trees very lofty, there are many wild mangoes along the ghat, the fruit is small and extremely acid.

The direction from the entrance of the ghat thus far, has been considerably north of east. Mr. B——'s road has never been surveyed, therefore the real direction is not known; I should not be surprised at

* From the specimens I have seen of the soils in which the tea plant grows, I should think these tracts would prove favorable to its cultivation, I have already described the climate.—M. K.

finding it the proper one from Byega to Terentee, I shall be the better pleased as there will then be no necessity for going near Keunjurgurh (which is far too much south,) and thereby all cause of discontent will be removed.

In the evening I ascended the highest spot of ground near the village, from whence I had a noble view of the country to the east, south, and west. The beautiful mountain described in yesterday's journal is seen in all its grandeur, bearing south-east; I took a rough sketch of it and the country below it. [See the plate.]

May 30th. Marched this morning at twenty minutes past 1 A. M. and reached our ground at 7 o'clock, distance nine miles per perambulator. I halted three times on the road, in all about an hour and a half, to allow the palkee to come up; I was led by a very rough path but not so much as yesterday, for the descent upon the whole is more gradual, with less jungle, and with care and ingenuity could be improved. I passed through three villages on the road; the first (which is deserted) at four miles and forty yards is called Keeragurh, the second at six miles and one furlong, Sura,—this one is a good size, and the boundary of Keunjur and Lehra, it is at the bottom of the ghat at the head of a long valley. At eight miles one furlong and one hundred and eighty yards I came to a large village in Keunjur called Turmagurh, three-quarters of a mile beyond which, or nine miles from Tungoora, is the small village of Ballera, both are in the centre of an extensive valley (bearing east and west) which is almost entirely cleared of jungle, likewise several of the hills. During this morning's march I searched in vain in the beds of all the nullas to find any traces of limestone rocks, the pebbles and boulders consisted generally of quartz, sienite, hornblende, felspar, greenstone, but no ores of any kind.

I saw but few birds, but observed a great variety of moths and butterflies of beautiful colors, and while resting under a tree I remarked a peculiar kind of stick worm. which formed a coat of fine straws and small pieces of bamboo leaves, the worm is about an inch and a half long; my attention was attracted to it by seeing a dry leaf travelling along, there were many of them; I was too fatigued to occupy myself with collecting either any of these or of the moths and butterflies. There seems to be always something new to learn, and to amuse the traveller; while resting, some of my people wanted to light their pipes, but there was no fire, one of the coolies volunteered to produce some, which he did by the following means:—the man searched for a piece of dry bamboo which he split in half, and with a piece of iron made a small hole in the centre of one of the joints on the inside, he then cut a small switch of a peculiar kind of pithy



VIEW OF THE MOUNTAIN OF MALAGIR IN ORISSA, INDIA - LEHRAGUM.

shrub to a length of about a cubit, he pointed one end, then two men squatting down, one held down the joint of bamboo with his toes and both of them spun the switch rapidly and constantly round between their hands, the pointed end being put into the hole in the joint the friction soon produced a blind heat which charred both pieces of wood, and eventually they took fire, the operation occupying about two minutes or less.

In the vallies, the soil is the same as that of the ghat. I was obliged to halt at this short distance on account of its having commenced raining. This is certainly a delightful country and climate, if I may judge from present observation the soil is capable of any cultivation, and I should think that the tea plant would thrive, also coffee and cotton.* The thermometer fell to seventy-five degrees last night and did not range above ninety-two degrees in the day-time; it cleared up at noon and there was a fine breeze which I was told is constant there, the thermometer was only ninety degrees at noon. I took my abode this day in a cow-shed, on the floor of which I had some fresh earth thrown and levelled, it was by no means an uncomfortable place, indeed the cattle sheds are the largest and best built huts to be found in the villages, and in the hot or in wet weather they are far more comfortable than a tent in every respect, and twice as cool.

On my arrival this morning I met Mr. Babington's jemadar, who was to have shewn me the road over the ghats, which he had represented as so superior to all others that had been examined; after a little conversation I soon discovered what degree of trust was to be put in his assertions, he was a very well informed man, and had travelled through every nook and corner in the Keunjur country in search of a better road than the present one, but like most natives he had but a very poor idea of a straight line, or of the points of the compass; hence much of the trouble which Captain Abbott had to complain of.

I resumed my march at four p. m. and proceeded down the Turma valley towards the great hill under which, on its eastern base, is situated the guruh and town of Keunjur. I was aware that the direction was altogether wrong, but I was at the mercy of my guides and of the jemadar above mentioned; they confessed that there was a better road in the direction I wished to proceed by, but that supplies had been prepared for me along the route they were leading me by, which had (they said) only one or two slight ghats.

* I should think that no doubt could exist as to the favorable nature of the soil of these tracts for the cultivation of any kinds of superior cotton.—M. K.

After proceeding several miles down the valley, which inclines considerably to the southward, I entered a narrow glen with large forest trees, I here came upon the road Capt. Abbott had surveyed, very near to the village of Tillopussi, situated in another glen branching off to the westward, and leading to the Muttighat; I proceeded along this road towards the Byeturní river and valley, and reached the former long after dark, distance about six miles. Just as the evening was closing I fell in with a huge bear and her two-half grown cubs, I had no fire arms loaded, therefore we hallooed and drove her off, the cubs clung to her back much in the same manner as young monkeys do, only that they rolled about and did not seem to hold so well. It was fortunate I had many people with me, otherwise she would most probably have attacked me; these brutes are far more mischievous and dangerous than tigers, for out of pure mischief they maul people in the most frightful manner, particularly in the mango season when they frequently take possession of a garden, and defy all attempts of the villagers to drive them out.

Just before reaching the Byeturní, I passed a rather large village called Colesaic, inhabited by Coles, a number of whom have lately located themselves in these hills by the Raja's invitation, (it is said) with a view to employing these savages in ransacking Lehra whenever a fair opportunity may offer itself. I had some difficulty in procuring a guide from among these, for they refused to come, and seemed inclined to resist us,—we succeeded in catching one surly creature, whom we with much difficulty compelled to shew us the way. Having crossed the Byeturní (the Styx of the Hindus, which is here nothing but an insignificant rivulet thirty yards wide, with scarcely any water) I resolved on encamping for the night, for I could not trust my Cole guide, whom I dismissed;—we lighted fires in all directions and went to sleep.

I should here remark that the Byeturní takes its rise in the adjacent hills about eight or ten miles further south, and winds along under the hills in a northerly direction for many miles, entering Singhboom and then turning to the east for a short distance, when it finally flows towards the south through Keunjur and Dekkenal into the plains of Orissa; in Rennel's map it is erroneously made to take its rise to the north of Singhboom. The source of the Byeturní, as well as the river itself is held sacred; it is said to issue from a huge mass of rock the shape of a cow's head, and that water flows from one nostril and sand from the other; a large fair is held there once every year; there are moreover places of worship with idols at every five coss (ten to twelve miles) from the source down to the holy city of Jájipūr in the plains.

May 31st. I resumed my march at twilight, and did not reach Kuddoogurh till past 11 A. M. On first starting, there was a gradual ascent from the river, the path passing through thin jungle along the base of some small hills to my left (north), the country to my right was open and undulating, with many villages and much cultivation; the high hill of Keunjur, called Baghtunga, was right in front; to the westward rose the beautiful range of hills I had just left;—the landscape was truly beautiful. Some of the smaller hills are cultivated to their very top, apparently with cotton, which ought to thrive well in such soil.

Having reached a pretty village called Coomíri, midway up the northern edge of this beautiful village, I had to turn to the northward and descend into a deep glen, then to re-ascend a rather steep slope strewn with masses of iron clay and iron ore, from thence I passed through a thin forest over a succession of undulations and ascents, more or less steep and difficult, up the north-west face of the mountain. The path, which is very narrow, after winding round it descends for one and a half miles inclining first to the eastward, again to the northward of east; it is excellent for the whole descent, but it is only three feet wide, and is neither calculated for carriages nor cattle, nor for a dawk road, I was therefore at a loss to find a reason for Mr. Babington's servant having ever recommended it for the dawk to travel by; on reaching my camp I was very angry with the man, which led to an attempt on his part to explain why I had been thus deceived and harassed,—suffice it to say that I discovered that there had been much chicanery on the part of the Raja's people as well as the postmaster's, it was this very ghat that poor Capt. Abbott had refused to travel over, and well he might.

Having travelled compass in hand, making occasional sketches, I found that I had been led twenty-two miles, (from Bullera,) in a course which proved to be nearly semicircular, instead of a direct line; it was evident from my observations at Kuddoogurh that I should have continued nearly due east from Bullera, I should then have come direct upon one of the dawk stations called Kalleapāl and have continued along the dawk road, the direction of which is very straight as far as Gorapursa in Mohurbhunj.

I had a fine view of the surrounding country from the top of the mountain, the Buddaum pahar (hill) of the Baumunghattí range (fifty miles east) was distinctly visible, the country between it and the Keunjur hills is tolerably level except to the north towards Kātkarin-jeh, where the old road used to run, there are numerous hills in that direction; it was quite evident that the road must be made direct

from the pass near Kalleapal to that to the southward of Buddaum pahar near Jushpur, in which case the present dawk road would be left entirely to the left (or north), and Keunjurgurh, where the Raja resides, would be left about eight miles to the southward, thereby all trouble to us, and annoyance to the Raja, would be at an end, for in verity, it appeared that the great desire to prevent the road passing through or near the gurh, was the great cause of all the mischief which had arisen; the Raja's dewan, who had come with a letter of compliments from his master, was overjoyed when I assured him that such was the case.

There being no hut available in the miserable hamlet of Kuddoogurh, I was obliged to take shelter under a small tree (for there were none of any size); the day was exceedingly hot, therefore I suffered a great deal. I felt very uneasy both for my own safety and that of my followers; we had the very worst of water, nearly putrid, and the cholera was sweeping away hundreds. The Raja had two days previously lost his mother, his eldest son, and a nephew by that dreadful scourge. We were all too much fatigued to be able to march again in the evening, so we passed the night where we were.

The Raja sent all kinds of supplies his town could afford, and insisted on my accepting all as my feast; I thought it prudent to humour him, for my offering payment would have been looked upon as unfriendly.

1st June. Having resolved on making a long march to the banks of the Byeturni, where I was sure of getting good water, I broke ground at 2 A. M. The road was good but very tortuous leading from village to village, sometimes to the north of the true line, at others to the south; the country is high and undulating, with many rocky eminences of grey granite which in many places protrudes through the surface, having the appearance of extensive pavements; there appears to be (generally) but a very thin stratum of soil for there are but few trees of any size, the most common is the pullas (*butea frondosa*) and a large shrub with a pretty white blossom, having an overpowering sweet odour which the natives are very fond of, they put it in their hair and through their ear-rings.

I travelled by many comfortable looking villages on my way; the proportion of jungle to cultivation is perhaps as five to one. The largest village I passed through was Phoolkonlaie,* about two miles before reaching camp. This place is a Sassun or Brahmun colony,

* It was from this place that I was driven back by sickness in January of the present year.

therefore the cultivation is extensive and superior, for the Brahmuns throughout Orissa possess the pick of the lands; there is much fine sugar-cane grown here.

Mungulpoor,* where I encamped, is twenty-two miles from last ground by the road, it is a miserable hamlet belonging to weavers (Tauntís) it is on the banks of the river, which is here 300 feet wide.

I encamped in a mango grove and passed another hot day, and in the evening was prevented continuing my march owing to a violent storm of wind, hail, and rain, accompanied by the most fearful thunder and lightning I ever witnessed; it came on at 6 p. m. I had no shelter but my palkee, which I took the precaution of having placed on some high ground near the huts and raised on four large boulders brought from the bed of the river; many large trees were struck with lightning, and others blown down, it cleared up about half past eight p. m., when the Raja's vakeels came, and had a very long conversation about the road, and unpleasant matter connected with it; I was however convinced that the Raja was not so much to blame as my predecessor had imagined, indeed it was my firm conviction that he had just reason to complain himself.

About 11 p. m. the sentry warned me of the approach of another storm—I resolved on braving it where I was; it soon came on, and twice as severe as the first; nothing could be more frightful than the lightning, and the peals of thunder made the very ground vibrate, it was truly awful, the rain poured in torrents; I lighted a candle to relieve my eyes from the glare of the lightning, and made up my mind for the worst; I did not expect to see the light of another day; I wrote a short memorandum in the shape of a will, and then fell asleep; the storm did not clear off till 2 A. M.

At a very early hour my visitors from Keunjur returned, and intreated me in the most earnest manner to accept the presents their master (the Raja) had sent me; they had the previous evening sent me word by one of my servants (a Brahmin) that they were prepared to pay me handsomely if I would insure that the road should not pass through Keunjurgurh, or any where near it, and that if I would take it out of their district they would even give more;—they alluded to this, and said that at any rate I must accept of what they had brought, otherwise the Raja would not think me sincere in my assurance; I however was determined on refusing, and reminded them of the orders of government, which they must be fully aware of. They still persevered, nor would they be satisfied till I promised to send a letter

* The survey this year was closed here, after halting for five days on account of the incessant rain; every soul was seized with fever.

from next camp to the Raja. This was sad want of faith, and a clear demonstration of the poor opinion they have of European integrity. I tried to ascertain the amount which the Raja had paid, but could not get at the real truth, though it was evident it must have been much; I repeated my assurances that there was no chance of the road passing near Keunjur, and stated that the Raja would be very wrong if he gave a single farthing more, and I requested that he would complain of any person who might in future make any such demands.

The vakeel complained loudly of the trouble, expense, and hardships, their master and his ryots had been put to, by the constant cutting of jungle, and exploring and opening new roads by the post-master's moonshís; however much exaggeration there may be, it is evident that these worthies have certainly much abused their power, and have lived (together with their servants) gratis on the fat of the land, I resolved on putting a final stop to this source of annoyance, by requesting the Raja to refuse to do any thing more, unless he received positive instructions from the proper authorities.

At sunrise I commenced my march towards Gorapura, a dawk station twelve miles distant; I first crossed the Byeturní which was fast rising, and was attended to the opposite bank (the boundary of Mohurbhunj) by the vakeels and their followers, who were then dismissed, I reached Gorapura at 10 A. M.; the country I passed over had a gradual rise the whole way with several light undulations, there appeared to be much heavy jungle to the right of the road, but in its immediate vicinity there is a fair proportion of clear and cultivated land. I passed one large village called Sukroorí two miles before reaching that of Terentí, where there is a dawk station; from thence to Gorapura there is one continued forest of small trees and underwood, the distance is about seven miles, and Terentí above six from the Byeturní; four miles beyond Terentí I crossed the Krère Bundun river, this water was about two and a half feet deep, and running very rapidly, the bed is gravelly and the banks exceedingly steep.

I encamped under a noble banyan tree and passed a pleasant day, for the air was very much cooled by the previous night's rain, the country in the immediate vicinity is also high and tolerably open, nevertheless it is dreadfully unhealthy; there is a guard of a native officer and thirty men from the Ramgurh battalion stationed here, it suffers much, there are seldom more than one-third of the men fit for duty, the rest being laid up with fever; I found the native officer to be a very well informed man, he was very attentive to my wants and gave me much valuable information; I got him to write a letter to the Raja of Keunjur at my direction, touching his offer of bribes, and sent

it off by the messenger who had accompanied me from Gobindpúr. I considered it advisable to have some respectable witness to this unpleasant business, for many good reasons.

I was about to resume my march at 5 P. M. when a dark north-west horizon indicated the approach of more bad weather ; a range of new huts had just been completed, I removed my palkee &c. into the largest which was also the most sheltered, it was that of my attentive host, the native officer ; I had barely time to remove when a fearful hurricane came on accompanied with heavy rain, and hail stones of great size ; almost every hut was blown down, or so much out of the perpendicular that they were rendered useless, the water was ankle deep ; I had taken the precaution to place my palkee on four large stones, so that I escaped the wet ; the storm lasted till near midnight continuing more or less violent ; I was more fortunate than I had been the previous night, and felt grateful for such shelter.

3rd June. I was unable to march before sunrise for want of coolies ; I then started onwards for Nowagaon, the second dawk stage in advance ; I had a very unpleasant trip, owing to the muddy state of the greater part of the road, my progress was very slow, not reaching my ground till one P. M. ; the distance travelled sixteen miles, the direction of the road was slightly to the southward of east, the country undulating as usual. For three or four miles it runs through a thin jungle, and then enters the clear land in the vicinity of the Buddaum pahar and of Jushpurgurh, at the eighth mile I reached a large village called Maldapursa, I rested here and breakfasted, after taking the compass bearings and sketching the features of the country ; I then proceeded on my journey,—the first mile or more is over the plain, the road then crosses the continuation of the Buddaum chain of hills, which ends three miles to the south-west by Jushpur ; there are three rugged ascents, and as many descents, they are impassable for cattle (laden) therefore very difficult for a palkee to be carried by, I walked the whole way I was informed that there was a passage round these hills by which the ghat, which is called “Tinderí ghat” can be avoided ; in my travels this year I have proved this to be correct, I shall allude to the subject in a future page. From the ghat to within a few hundred yards of Nowagaon, the forest is very heavy, but the road is good.

I shall not say more of Nowagaon at present than that it is near the western extremity of a long narrow and once thickly populated valley in the zemindari of Baumúnghattí, the whole of which is now a vast forest, having been devastated during the Cole insurrection consequent on the difference which existed between Narindra Maha-

patnr, Zemindar of the Purgunnah, and his lord the Mohurbhunj Raja ; there are about twenty-eight miles of dawk road down the valley, and four dawk stages, viz. Nowagaon, where I encamped, Arjunbilla, Pooranapání, and Kurrumbilla, this last place is at the eastern extremity at the top of the Nittai Maunghur ghat by which you descend to the plains.

I left Nowagaon before sunset, and pushed on to Pooranapání, where I rested part of the night ; I had much difficulty in procuring even a couple of coolies to replace two who had escaped, in consequence of this I discovered another piece of impudent roguery of one of the Cuttack myrmidons, a servant of mine having peached against him, it was this ;—I had tried all manner of means to prevent him from pilfering as he passed through the villages, he had however managed to collect a heavy cooly load of bows, arrows, banghy sticks, laticies (walking clubs) and fowls, added to these a charpoy, this I took away during his absence, and threw it into a thicket, the former articles I hid in the thatches of the huts, took the cooly for myself, and marched on.

About three A. M. of the 4th June, I continued my journey, reaching Bissái, a large village three miles from Pooranapání, at day break ; I here changed coolies, and proceeded on to Nowagaon Oopurbaugh which place I reached at noon, having travelled forty-nine miles, within little more than twenty-four hours ; at four P. M. I resumed my march towards Seersa, on the banks of the Subunreeka, which place I reached a little after sunset ; the distance was only five miles, but I was detained for an hour in a large village owing to a severe north-wester ; I found my dawk ready, and bidding farewell to the jungles started for Mednípúr, which station I reached the following morning ; I rested there during the day, and continued on my dawk trip to Oolooberriah, arriving at ten A. M. ; having procured a boat, I left this place by water and reached Calcutta at sunset ; thus ended my labours for the year 1838, having from the 16th December previous up to the 5th of June, travelled upwards of 2100 miles.

Having passed so rapidly from Gorapursa to Mednípúr I could not observe much, I have this year reconnoitred all this tract of country in the course of my survey duties, I shall therefore conclude with a few marks on its features and capabilities.

(To be continued.)

JOURNAL

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No. 92.—AUGUST, 1839.

ART. I.—*Note on the Mechis, together with a small Vocabulary of the Language.* By A. CAMPBELL, Esq. Assistant to the Resident Nipal, in charge of Darjeeling.

To H. T. PRINSEP, Esq.

Secretary to Government of India.

Fort William.

SIR,—With reference to my letters of the 13th and 20th ultimo, I have the honor to forward a few Notes on the Mechis, with a small vocabulary of their language, for the information of his Honor in Council.

I have the honor to be, Sir,

Your most obedient servant,

A. CAMPBELL.

Darjeeling, September 5th, 1839.

The Mech people inhabit the forest portion of the Turai stretching along the base of the mountains from the Burrumpootur to the Konki river, which leaves the Nipal mountains about 20 miles to the west of the Mechi River. In this tract they are respectively the subjects of the Nipalese, Sikim, and Bootan governments, occupying along with the Dimals—an allied tribe—and a few Garrows, a country of about 250 miles in length, having an average breadth of from 12 to 15 miles. In the eastern portion of the Nipal Turai they are but recent settlers ;

at Nagol Bundi, on the right bank of the Mechi river, there are about 20 families; at Kalikajhar about the same number; and, west from these places, in the thickest parts of the forest, there are several small colonies, amounting in all to about 150 or 200 families. In the Sikim Turai, between the Mechi river and the Mahanuddi, there are about 400 families; to the east of the Teestah river, and in the Dooars of Bootan they are still more numerous, and to this latter portion of their *habitat* they point as the original seat of the tribe, although its name would indicate its derivation from the Mechi river. I believe that Mechis are also to be found on the northern confines of Lower Assam.

The tribes immediately in contact and mixed with the Mechis, are the Koochias or Rajbungsi Bengalese, (whose original country is Kooch Behar,) the Dimals, Thawas, and Garrows. These neighbours of the hills are the Limboos, Kerantis, Lepchas, Murmis, and Bhotias; of these several tribes, I hope to furnish some particulars anon. As they associate much with the former, and frequently meet the latter at the frontier marts, their habits and manners are naturally a good deal modified by the contact; still their peculiar usages, form of religion, language, and appearance, entitle them to the acknowledgment of their claim as a distinct people. They are fairer than the Koochias, and have little of the regular features of the Hindoo, which characterize that tribe. The cast of the Mech countenance is strongly Mongolian, but accompanied by a softness of outline which distinguishes them readily from the more marked features of the same order—of the Lepchas, Limboos, and Bhotias. They resemble the Newars of the valley of Nipal, in complexion and feature, more than any other people I have seen in or near these mountains; they are taller, however, and the fairness of complexion is entirely of a yellow tinge, whereas the Newars are frequently almost ruddy. Many of the Mechis strongly resemble the Mugs and Burmese in face and figure, and like them are much addicted to drinking spirits, smoking, and eating pawn. In common with the Assamese, they are fond of opium eating.

They never live on the hills at a higher elevation than 800 or 1,000 feet, and scarcely ever settle in the cleared and inhabited parts of the Turai, but, keep entirely to the forest in which they make clearances, cultivating crops of rice and cotton with the hoe, and grazing buffaloes. The malaria of the forest so deadly to strangers, does not at all affect them; on the contrary, they are a remarkably healthy race, and dread visiting the plains, where they are subject to severe fevers. They have no towns, and rarely even live in permanent villages, generally quitting a clearance after having had two or three successive crops from the land, to take up their abodes in a fresh portion of the forest. In the

above respects the erratic habits of the Mechis resemble those of the Thawas especially ere that race commenced, as lately, to form permanent villages in the open Turai; and are identical with those of the Dimals.

The religion of the Mechis, in so far as they have any, is the Shivaite form of Hindooism, but it goes no further than to the occasional sacrifice—when they can afford a merry-making—of goats, buffaloes, pigs, and fowls at a clay image of Kali, when they drink spirits and a fermented liquor made from Murwa to excess, and indulge in much licentiousness. The influence of the Brahmins is not recognised; they have no guroos, nor priests, nor temples; do not perform the shrādh; and bury the dead in any convenient part of the jungle, confining the obsequies to a feast among the relations of the deceased, and placing spirits and prepared food over the grave; tombs are never raised over the graves, nor have the small communities any common burying ground.

There is no distinction of castes among them. In the Nipal Turai the population of which is composed of the most varied assemblage of would-be Hindoos, and almost destitute of real ones, the Mechis are admitted within the pale, and water is taken from their hands by persons of caste, although they eat fowls, buffaloes, the cow—when beyond the Nipalese limits—and the carrion of all animals except that of the elephant, which animal is held in high respect by them, although not venerated, so far as I can learn. The carrion eating and other impure but cherished practises of the Mechis are not followed to the fullest extent in Nipal, where Hindooism is at a high premium, and breaches of the Hindoo law by all pretenders to that faith are punished with much severity. In Sikim and Bootan, however, the Mechis indulge their natural habits, and are as omnivorous a race of human beings as any in the world.

Marriages are contracted in youth or adolescence at convenience, the men purchasing their wives at prices varying from 10 to 60 Rupees, according to the beauty of the female and the means of the male. When an accepted husband has not the means of paying for his wife in money he joins her family party, working for the parents until he has fairly earned his bride according to previous contract; like the poorer classes elsewhere in India, a man can seldom afford to have more than one wife at a time, there is no restriction however on this head.

The women share equally with the men in all the labors of the field, and manage household affairs exclusively; they likewise attend at the periodical fairs (Hauths) selling, buying, and bartering the various

articles of home and imported produce. They are generally comely and disposed to fleshiness ; the usual dress is a sari (robe) of red silk made of the "Indi" or thread of the silk worm which feeds on the castor-oil plants, and their ornaments are confined to bangles and necklaces of white shell. The Indi silk is entirely a domestic manufacture, and wove by the women, who also color it with the lac dye. The Mech language has no written character, nor is it, I believe, allied to the Sanscrit ; whether it is of Tibetan or Burmese extraction, or akin to the aboriginal Indian dialects known among the Coles, Goonds, Beels, and other wild tribes, I am unable to say ; but perhaps, the accompanying small vocabulary may enable competent persons to decide its root and original country. The Mechis are necessarily uneducated, except with a very few exceptions, in the Bengali language, from which they have derived all the terms in use for articles common to a state of life removed from the savage. I regret, that I have not as yet had an opportunity of meeting a person intelligent enough to give me some idea of the construction of the language ; this must remain for further inquiry. In the vocabulary I have omitted entering words for which the language has no equivalents of its own, except in a few instances, to prove the rule above noticed. All the words with B affixed are evidently corruptions of Bengali or Hindi ; none of the metals except "silver" and "iron" have names. There is no word for "money." Gender is designated by the affix of "Jilla" or male, and "Jeu" or female, for all animals but man.*

In the arts the Mechis have made but small progress, they excel in the care of their cotton agriculture, but as they grow only the common annual plant, the produce is not of a superior kind. Weaving is confined to the women as a domestic art. They are not addicted to trade, are averse to military service, have no artizans among them, are truly in a very primitive state of society. They are however very cheerful, have no jealousy or prejudice towards strangers, are industrious, and honest, and crimes of violence, so far as I can learn, are of rare occurrence among them.

A. CAMPBELL.

* The names of the months and days of the week are Bengali, and the Mechis who furnished me with the vocabulary are unable to give more than nine of the cardinal numbers in their own language.

VOCABULARY OF THE MECH LANGUAGE.

| | |
|-------------------------|-----------------------------|
| fire, wad | tiger, meesāh |
| water, dīee | bird, tausen |
| air, bar | the sun, kranondoong |
| the earth, ha | the moon, nokabur |
| stone, yoontie | guroo, mōōsho |
| God, modīe | hog, yoma |
| father, appa | rice, myrang |
| mother, aiē | paddy, mye |
| brother, koī | cotton, rōōn |
| elder ditto, ada koī | blood, tye |
| younger ditto, āki koī | flesh, mōōdun |
| son, bēēsha | hair, kumun |
| daughter, bēēsha hindon | teeth, hattye |
| uncle (paternal), adhii | eye, mōōkun |
| ditto (maternal), amai | nose, kōōntōōng |
| cousin (paternal | ear, kumma |
| uncle's son), phōōmbōi | head, koroh |
| wife, bihi | neck, kortunna |
| house, nau | mouth, koogha |
| raining, noka haioo | tongue, chulai |
| tree, bun phang | thorax, cherupa |
| bamboo, wah | belly, udihi |
| rattan, rydung | thigh, phenda |
| iron, shor | leg, yadii |
| wood, bon | foot, yappa |
| sword, choongri | stars, hatoorki |
| knife, dhaba | clouds, jumai |
| bed, kutt | knee, hantoo |
| dog, chēēma | finger, nāshima |
| elephant, megadett | nail of ditto, nashi kōr |
| rhinoceros, gandha | palm of hand, nakatulka |
| goat, borma | loins, janji |
| road, lama | child, kataū |
| mountain, hajoo | old man, briebà |
| jungle, hakea | young ditto, kōōkringindong |
| river, dihi | ditto female, shikala |
| pool, bilōō | handsome, mōōjang |
| fish, nah | oil, taū |
| snake, jeebo | salt, shōōnkri |

pepper, banjóóloo
 maize, toomba
 to die, thibaî
 to sleep, móódóóbaî
 sit down, jhopiî
 stand up, jhickat do
 go thither, oojhung tang
 come here, puki
 go quickly, kōōkri tang
 lie down, moodoo no.
 shut the door, doowar phang
 go to the field, hooa tung
 build a house, no lao
 cut some wood, bon san
 fetch some water, dīee labo
 feed the child, koto jani ho
 kill a fowl, tāoo shītuk
 boil some rice, meekum chong
 light a fire, wad chāō
 milk the cow, doodoo laboo
 go to market, hattia tung
 shoe, jotah (B)
 horse, ghorye (B)
 cow, mashujuh
 buffalo, maishuo
 door, doowar (B)
 ghee, ghu (B)
 milk, doodu (B)
 sugar, chinee (B)
 turmeric, huldi (B)
 thunder, jumai homidung
 lightning, nophlambo
 cloth, (cotton) he
 ditto of castor-oil insect, indi
 ivory, megadet hatye
 horn, kong
 hide, āboo
 hoof, yakong
 tail, lanjye
 wool, komun
 a young elephant, megadet oodai
 a grave, phokma

a man, manchi
 a woman, hinjan
 plough, wayo
 cart, hoo
 a bow, jeelcet
 an arrow, bulla
 language, bhagia
 a gun, shelaî
 table, phalla
 chair, kumpulai
 paper, lēka
 pen, kullum (II)
 lock, [no word]
 key, [ditto]
 taut (coarse hempen cloth), phasala
 hemp, phātoo
 til (sesamum orientale), shibeem
 mustard, bishwar
 dal (pease), shobai
 pawn, phātye
 betel-nut, gwȳe
 lime, chūnye (II)
 brass, peetulye (II)
 silver, tais
 a temple, modie ne nō (literally
 house of God)
 a flower, booibar
 mangoe, tiekjo
 plantain, tai
 ditto tree, lie phang
 lime tree, narengi phang
 fruit, betū
 root of tree, rudda he phang
 branch of ditto, dalye
 leaf of tree, belye
 a bridge, chyē kong
 build a bridge, chyē kong ka
 make a road, lama yāw
 a plain country, ha gēbang
 the plains of Bengal, haien
 Bootan, aga phar
 snow, hem

| | |
|-----------------------------|-----------------|
| snow falls, hem gooklindung | blue, goochum |
| it rains, noka hidung | white, goophoot |
| warm water, goodung dýe | red, gujja |
| cold ditto, gooshu dýe | yellow, koomoo |
| drink water, dye ling ni | green, gangohu |
| good, gahum | black, koomun |
| bad, húmma | |

[No other Colors distinguished by names]

| | |
|---------------------------------|--------------------------------|
| leather, bigoor | to swim, chanturri |
| mattress, gondoo | cotton seed, koon tye |
| a Bootanee, kongar | ditto plant, koon phang |
| a Bengalli, hāshá | sugar-cane, kooshiar (B) |
| a Mahomedan, tōōrōōp | a bear, moosur |
| a Priest or pujari, modie hōōis | wild dog, sheekoo |
| a Nipalese, muggur | vulture, sheegoon |
| a boat, nan | crow, taūka |
| a jungle fowl, hangrāni dāusru | a well, dire kor |
| a male, jilla | blacksmith, kamar |
| a female, jeu | weaver, he daio |
| spirits, chao | hunter, mye kankea |
| large, ghidett | a spotted deer, kotia menbeang |
| small, udye | distiller, shoondi |
| tall, gujau | fine cloth, he goba |
| short, gahye | coarse ditto, he rujja |
| broad, goo-ar | new ditto, he guddan |
| a great man, grah manichi | the sky, no krang |
| to laugh, meniyo | above, chá |
| to cry, dagup | below, ching |
| to beat, shūtuknuh | to one side, chapin |
| to be angry, brapmo | |

Cardinal Numbers.

| | |
|---------------|--------------------|
| one, munche | five, munbha |
| two, munye | six, mundho |
| three, muntum | seven, munchini |
| four, munbre | eight, munjo kunni |

[No numeral beyond this]

| | |
|-----------------|-------------------|
| night, her | hard, guzia |
| day, chán | cheap, gair |
| month, más (B) | dear, kom |
| year, buruk (B) | heavy, eeliching |
| soft, oofra | light, rujenchung |

| | |
|--------------------------|-------------------------------------|
| wet, ghichi | fever and ague, loomgaia |
| dry, kran, | rheumatism, beeshtong |
| beard, konkup | belly ache, yudichaia |
| moustaches, [no word] | head ache, koro chaio |
| lip, kooshuti | purging, kābai |
| eyebrow, mooshu kor | to-day, dinisanchi |
| eyelash, moosheam | yesterday, kapunsanche |
| good rice, mujang myrong | day before ditto, sombursanche |
| sweet, kolan | the day before that, tamnepursanche |
| sour, kokye | to-morrow, miasanchi |
| bitter, goká | outside, shetula |
| light, monabai | inside, noh |
| darkness, komshibai | before, shekang |
| raw, kotung | behind, yeun |
| boiled, komun, | quickly, kookci |
| hunger, meenka honkia | slowly, larhay |
| grass, jheekāb | a wall, jujoor |
| lame, nating kora | a post, tongphang |
| deaf, kumma kanai | a beam, mandali |
| dumb, ryeinga | a roof, mookoom |
| pain, sadung | a cooking pot, kanta |
| pleasure, moongu sagyi | a large ditto, mikamduh |
| sickness, chobea jodung | a water cwer, di heu |
| small pox, bontijaia | a plate, toorsi |

Example of forming feminine and masculine.

| | |
|-----------------------|---------------------|
| bull, moshu jilla, | cow, mashu jeu |
| dog, cheema jilla, | bitch, chema jeu |
| buck, borma jilla, | she-goat, borma jeu |
| tiger, meeshāh jilla, | tigress, meesah jeu |
| nephew, adye, | niece, anai |

Sentences.

| | |
|-----------------------------------------|----------------------------------|
| What is your name? | nunni mooa mamoo |
| Where are you going? | noo bujuntanguh |
| Whence come you? | noo bujung prapaio |
| Where do you live? | noo nūa mongwhyē |
| What is your father's name? | noong noorkpa mammo |
| Shew me the road to Pankabari? | Pankabari lama buriye |
| What is the name of that hill? | be hajoo māmo |
| What is the price of rice at Dorjeling? | myrong sirifehe Dorgeling maelai |

*Names of Men.**Names of Women.*

Chakla,
Sunka,
Balasache,
Deringa sache,
Poojoon,
Esula,
Puharoo,
Oonti,
Jenti tokla,
Mhedla,
Secuta.

Phagooni,
Bisaje,
Bisahawa,
Furgunnic.

A. CAMPBELL.

ART. II.—*Researches on the Gale and Hurricane in the Bay of Bengal on the 3rd, 4th, and 5th of June, 1839; with reference to the Theory of the Law of Storms in India.* By HENRY PIDDINGTON.

PART II.

That the hurricane part of the tempest which we are considering was blowing in tolerably well defined circles, has been, I think, clearly shewn in the foregoing part of this memoir. The object of this second part, is to adduce evidence, which shews that it was at the same time both a *gale*, i. e. a strong wind blowing in with tolerable steadiness from one quarter of the compass; and a *hurricane*, namely, a violent wind blowing in a circle or vortex of greater or less diameter. At present too it seems probable, from the dates, that the gale produced the hurricane. We may consider that this storm was one of those which usually occur at the change of the moonsoon from NE. to SW., which in various parts of the Bay may be said to take place between the 15th May and 15th June. It is from the 1st to the 15th June that we look for the rains in Calcutta, though sometimes, as in this year, they may be said to have begun in April. It will be borne in mind then, that whatever follows, whether facts or hypotheses, relates only to the beginning of the SW. monsoon. Future observations will inform us, whether the October Gales as they are called,—though they sometimes occur in November,—are subject to the same or different laws. (The European reader will recollect, that October is the epoch at which the NE. monsoon takes the place of the SW. one.)

If we look at the Bay of Bengal, Map No. II, we shall be struck with the fact, that while it is bounded on the East by the mountain range which stretches from the Malay peninsula to Bootan, often approaching very near the shores, and rising to the height of from 3000 to perhaps 5000 feet on the Arracan coast; it is also bounded, on the West, by the Coromandel range, which supports the Eastern side of the elevated table lands of the Deccan. At the valley of the Mahanuddee (the river of Cuttack) however, at its junction with the Vindiya range, it turns suddenly to the North-Westward and Westward, leaving thus between it and the mountains of Arracan, the wide opening from Point Palmiras to Chittagong, which, to use an orientalism, is the *gate* to the plains of Bengal.

The salient angle, formed by the corner where the Vindiya and Coromandel ranges meet, and the entering one, where the Bootan, or Himalaya, and Arracan and Cachar ranges join (leaving however the valley of Assam as an opening for the great Burrumpooter to flow through.) thus form, as it were, an angular channel; through which all the lower strata of the current of the SW. monsoon may be supposed to find their way over the plains of Bengal and up the valley of the Ganges; and this is their natural course. But we may suppose that the SW monsoon when urged to any great force at the mouth of the Bay, about Ceylon, must strike against the mountain ranges of Arracan in about from lat. 16° , which is that of Cape Negrais, to lat. 20° or 21° ; or about that of Arracan; and, being deflected thence, must turn off in a paraboloidal line towards the great opening offered by the low lands at the head of the Bay, and thence proceed up the valley of the Ganges as before.

But when the head of the Gale is thus deflected, it may meet also with that portion of the monsoon which has blown along the Coromandel range and coast—called the “long-shore wind,” by the old navigators—which has a much shorter distance to travel; and there occasion an eddy of variable winds, whirlwind or hurricane, according to the force of the first impulse—and this again influenced too, doubtless, by many causes to which we are yet strangers.

If this theory be true for these tempests, we should look to find points, about the meeting of the two currents, varying in position according to their respective forces, at which, during these gales, it should be comparatively calm, or blowing but moderately; and it is curious that at Balasore, in latitude $21^{\circ} 28'$, and at the Black Pagoda in $19^{\circ} 62'$ N. this comparative calm is found to have existed. My authority for this is the following letter.

Balasore, July 31st, 1839.

DEAR SIR,—I should have been much at your service in giving you all the requisite information concerning the gale here, had any taken place, but we had only strong gusts of wind at NE. to SE. with uncommon heavy rain on the 5th, 6th, and part of the 7th of June, which even to this day has kept back the rice crops. The thermometer fell to $81\frac{1}{2}^{\circ}$, and unluckily my barometer was broken a few days prior, so that we could only foretel a gale coming on by the blackness of the heavens to the Eastward; which gale did not reach from the Northward of Point Palmiras to Balasore, but blew hard from Point Palmiras to below Pooree to the Southward. No vessels were lost in the Balasore roads; but to the Eastward they may have been lost, as a Telingah topgallant mast was picked up, besides pieces of deal boxes, supposed to have contained glass-ware, marked "*Protector*," which vessel was lost to the Eastward, between the reefs, last October.

Gales at Kedgerree, though blowing dead to windward of us, distant seventy-five miles, do not always reach this coast; as in the May Hurricane of 1833, when the "*Duke of York*" was blown from her moorings at Saugor across to Hidgelee, and became a wreck, yet the gale did not reach here, although the bank to the Eastward in the heavens so plainly indicated a gale, that every person here barred up their doors and nailed them. We only had a good topgallant breeze.

The Neilgherry Hills appear to influence the winds much on the coast north of Point Palmiras, as the winds are generally throughout the SW. monsoon, SW. to W. in the morning to 7 A. M. veering round to S. and SE. P. M.; and in the NE. monsoon, W. to NW. veering round to NE. after 8 A. M.

(Signed) A. BOND.

Mr. Richardson, Branch Pilot, informs me, moreover, that during the fury of the Gale of 1833, in which the "*Duke of York*" was wrecked, and he himself was driving about with all his anchors down, some passengers whom he had previously landed at the Black Pagoda were upon the top of it, and felt no excessively violent wind, though they saw the horizon very black, and the sea dreadfully agitated to the North Westward of them.

The slow rate at which our vortices travel onwards is very remarkable, but seems, if future observation should confirm it, to afford countenance to this theory; for, as before said, we may consider them as pent up between the current passing round the vortex of the parabola and the Coromandel range; and no doubt to feel, as water in similar channels would do, the repulsion from these last. It is clear, as shewn in p. 576, by the log of the "*Indian Oak*," that the monsoon was blowing up along the coast as far as Vizagapatam, from between which and Gan-

jam, to Point Palmiras, the Hurricane was probably felt. Its limit to the North we well know to have been between Point Palmiras and Balasore, but I could obtain no intelligence from Ganjam to fix a limit to the South.

We should also find that, as the current of air proceeds up the valley of the Ganges to the North Westward, it should give rise to an Easterly Gale, which has also in this instance occurred, as will be seen by the following extracts, the first being from a very able and interesting letter from Mr. Ravenshaw, of the Civil Service, dated Chuprah in Behar, lat. $25^{\circ} 46'$ N. long. $84^{\circ} 46'$ E.

Chuprah, July 17th, 1839.

DEAR SIR,—Having observed in the Newspapers that you are desirous of obtaining information connected with the Gale which occurred in the Bay of Bengal from the 3rd to the 5th June inclusive, I have the pleasure to contribute my mite to the stock of facts which you are engaged in collecting. The enclosed extract from my Register will shew the height of the Bar. and Ther. at $10\frac{1}{2}$ A. M. during the Gale, and for some days succeeding it. I regret that my official duties prevented me from taking observations at $4\frac{1}{2}$ P. M.; but I hope the small amount of information afforded will not be without use, in shewing the direction and duration of the Gale of this district, inland from the Bay of Bengal. It will be remarked, that the Gale did not commence here until the 4th instead of the 3rd June, and that it terminated on the 7th instead of the 5th. The Bar. kept falling during the continuance of the Gale, and strange to say did not reach its minimum until the day after the violence of the Gale had ceased, i. e. the 8th. The direction of the Gale was nearly due East. but on the 8th the wind shifted to the SW. and West, and on the 9th blew as furiously from the latter quarter as it had previously done from the East; towards evening, however, it shifted to the NE. On the 10th it changed to SE., on the 11th to SW.; and the following day to the West. On the 14th and 15th it again veered to the NE. and EbN. until on the 16th it resumed its old position of East, which is the usual direction from which it blows at this season of the year. From the above it would appear that the wind, after the violence of the Gale had subsided, acquired a rotatory motion and turned twice round the compass in a Southerly direction before it recovered its equilibrium. By letters received at the time from Mootebarry, 60 miles North of Chuprah, and from Gyah, about 90 miles South of this station, I learnt that the Gale occurred with equal violence at those places. The breadth of the column of air put in motion was therefore at least 150 miles, and probably much greater. It would be interesting to ascertain the exact limits of this Gale inland as well as at sea, which object might be effected by your addressing a circular letter to the residents at each of the principal stations in the Western Provinces e. g. Allahabad, Cawnpore, Agra, Delhi and Saharunpore. In-

formation from these points would probably give the extreme length to which the Gale extended, as information obtained from Jubbulpore, Gwalior, and Ajmere, would shew the extreme breadth. I do not recollect at present from what direction you stated the Gale to have blown in the Bay of Bengal, but if from the SW., the usual course of the monsoon, it is difficult to account for its blowing here from the East, unless we suppose the column of air to have been driven against the Assam and Himalaya Mountains, and by them turned in a Westerly course. In this event, it is probable that the Gale may have subsequently followed the direction of the mountains NW. perhaps as far as Hurdwar.

I conclude that it is not your intention to confine your observations and inquiries to the Gale under consideration, but to all storms of magnitude in the Bay, or its vicinity. The Gale which seems to occur almost annually in the Bay of Bengal in the month of October, would, from its regular recurrence, form an excellent subject for observation. It was felt at Chuprah during the two years that I have been stationed here. On the first occasion it blew (to the best of my recollection) from the East, whereas last year it came from the West.

It appears to me very desirable that either Government or some public body like the Asiatic Society, should take measures for securing an uninterrupted official record, not only of the periodical and occasional storms which extend generally over large tracts of country, but also of local atmospherical peculiarities—the changes in the direction of winds and storms occasioned by mountains and the larger rivers—also of the general character of the seasons in different parts of the country—the paucity or abundance of rain—the minimum rise of the Ganges, Burrumpooter, &c.—the price of grain as affected by the seasons—the date of the commencement and termination of the rains—of the hot winds—or of any other prevailing winds.

The Asiatic Society through its numerous members might, I should imagine, without difficulty obtain information on the points adverted to from all the principal stations in India, which should be annually digested and published in their *Journal*. These again will be compared and generalized every 10 years or so by a Meteorological Committee of the Society. The Asiatic Societies of Madras and Bombay might be requested to adopt the same system throughout their respective Presidencies, so that the observations might embrace the whole of India. Such a combination of laborers in the cause, and the consequent accumulation of facts, assisted by the rapid progress of science in these days, would almost justify the hope that we may ultimately arrive at the discovery of some general laws by which the seasons are regulated; and by which we may be able to foresee and to guard against both inundation and famine, in a country where their ravages are often so destructive to life and property.

(Signed)

E. RAVENSHAW.

| 1839. | Bar. at 10½ A. M. | Ther. attached | Bar. at 4½ P. M. | Ther. attached | Bar. at 10 P. M. | Ther. — | Remarks. |
|----------|----------------------|-------------------|---------------------|-------------------|---------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| June 4th | No observation. | | | | | | Strong and con- tinued gale from East, with occa- sional rain. Rain; wind SW shifting to West. Ditto, W. do. to NE. Ditto, Wind SE. Ditto, SW. Ditto, W. Ditto, W. Ditto, NE. Ditto E.N. East, the usual di- rection of the wind at this season. |
| 5 | 29.50 | 86 | .... | .... | .... | .... |  |
| 6 | 29.42 | 86½ | .... | .... | .... | .... |  |
| 7 | 29.32 | 83 | .... | .... | .... | .... |  |
| 8 | 29.30 | 84 | .... | .... | .... | .... |  |
| 9 | 29.34 | 84½ | 29.32 | 82½ | .... | .... |  |
| 10 | 29.30 | 82 | .... | .... | .... | .... |  |
| 11 | 29.39 | 83 | .... | .... | .... | .... |  |
| 12 | 29.38 | 85 | .... | .... | .... | .... |  |
| 13 | 29.38 | 85 | .... | .... | .... | .... |  |
| 14 | 29.47 | 87 | .... | .... | .... | .... |  |
| 15 | 29.38 | 87 | .... | .... | .... | .... |  |

N. B. This gale extended in *breadth* from Mootebarry, 60 miles North of Chuprah, to Gyah, 90 miles South—and perhaps further, but of this I have no authentic intelligence.

As far then as our present knowledge extends, and referring to the state of the Gale in the Southern part of the Bay, we find that the impulse, which may be said to begin to be violently felt on the 31st by the *Susan*, did not reach Chuprah till the 4th, when it produced an Easterly Gale, terminating on the 7th, shifting to the South-West and West on the 8th; the counter-gale and eddies, if we may so call them, being only the irregular movements of the various currents produced by this great derangement of the usual equilibrium of the aerial currents, which, as is remarked, are usually from the East at this season; affording also a proof towards the theory which I have ventured to offer. When the monsoon slackens the Southerly and South-Westerly gales, and currents may find their way as far inland as this place. The dates show that the Gale did not begin at the point to which it blew, but that it was a progressive impulse travelling about the direction which I have laid down. Assuming this theory as a *guide* only, let us now see how it accords with the facts we already possess here. By referring to the Map, No. II. we see that though along the coast from Madras to Vizagapatam, by the Indian Oak's log at Masulipatam, by the Master Attendant's report from Coringa, and up to the 3rd at noon by the Laurel Amelia's log, it was fine, though threatening; yet from the 31st May to the 5th June, by the logs of the Lady Macnaghten, Petrel, Susan, Jumna, and Laurel Amelia—to which too we might add those of the Nine, Eden, and Mobile—a severe gale was blowing between WbS. and SW. diagonally across the Bay, in lines about parallel to one drawn from the centre of Ceylon to Cape Negrais, the termination of the Arracan coast. We find that at Cheduba on the

2nd, and part of the 3rd, the John William Dare had a severe gale from S. to SSE. the gale being then deflected by the mountains of that coast. At the harbour of Akyab No. 27. we find that our meagre notices give us "Easterly winds with hard gales" on the 2nd; on the 3rd, and 4th, "brisk;" on the 5th, "gales;" and on the 6th, SW. winds.

At Dacca* Dr. Lamb's Register gives as follows:—

| | Winds. | Bar 10 A M | Ther. Noon. |
|-----------|----------------|------------|-----------------------|
| June 1st. | SE. East SE. | 29 68 | 90 |
| 2nd. | SS. East, | „ 64 | 90 |
| 3rd | East South SE. | „ 64 | 91 3 inches of rain. |
| 4th. | East SE South, | „ 68 | 88½ 6 inches of rain. |
| 5th. | South SE. S.E. | „ 71 | 85 |

So that here the winds were varying between South and East.

At Jellinghee, in lat. 24° 3', long. 88° 42' E. about 140 miles WbN. of Dacca, and about 100 NbE. of Calcutta, at the spot where the river of that name branches off from the great Ganges, a memorandum informs me as follows:—

June 6th. strong Easterly gales with frequent showers.
 „ 7th, ditto ditto.
 „ 8th and 9th, Frequent showers and cloudy weather.

The following is an extract of a letter and memorandum from H. B. Beresford, Esq. Deputy Collector, Purneah.

"The observations from 4th to 10th inclusive, in the following memorandum, were made on the Ganges, some miles south of Purneah—at least so I understand Mr. Palmer to say:"

Transcript of Extract of Day Book, 1839.

| | |
|-----------|--------------------------------------------------------------------------------------------|
| June 1st. | Wind E. blew hard and rained in the morning. |
| 2nd. | Wind E. a warm clear day. |
| 3rd. | Wind E. clear morning, rained heavily in the afternoon, and blew hard from South at night. |
| 4th | Wind E. blew fresh. |
| 5th | A strong gale from the East—rained a great deal—a wet rainy night. |
| 6th. | Blew hard the whole day from the East, and squalls accompanied with rain came frequently. |
| 7th. | Wind SE. in the morning—East at noon; died away in the afternoon, rained a little. |
| 8th. | Wind S. and SE. |
| 9th | Wind East—rained a great deal and blew fresh. |
| 10th. | Wind ESW. and E. again—rained a great deal. |

* The Indigo planters of the district of Dacca and the Eastern part of Jessore are well aware of the tendency of strong Easterly winds to cause rapid rises of the river, and severe loss to them by inundating their plant. If we suppose the Easterly gale to be a Southerly and South Westerly one in the Bay, we obtain an additional reason for this, to the common one of the Easterly gale being partly against the current of the Ganges; i. e. the waters of the ocean are driven up into the NE. corner of the Bay.

"The inclosed notes I made in original, and regret not having it in my power to comply more fully with your request."

June, 1839.

- June 1st. Light airs from NE. to E. cloudy at times.
 2nd. Ditto, Ditto.
 3rd. ENE. cloudy, or slight showers from ESE.
 4th. Ditto, ditto light fresh breezes with slight showers.
 5th. Heavy ENE. wind, very cloudy with light showers
 6th. Ditto ENE with constant sleet and rain.
 7th. Heavy ENE. with sleet, wind veered S to SSE. occasional showers.
 8th. Heavy ENE. veering round to South with rain—night, Northerly.
 9th. Fresh ENE cloudy with heavy showers.
 10th. Rain almost all day—clouds flying from East—Light airs from West, a great deal of rain has fallen, the nullahs rising very high, threatening to overtop their banks.*

At Ghazee pore lat. $25^{\circ} 35'$ N. long. $83^{\circ} 33'$ E and 41 miles East of Benares and 84 miles W. $\frac{1}{2}$ S. from Chuprah, Dr. Jackson kindly forwards me a journal for the month of June, from which the following is an extract, which I copy to the 11th, to shew how remarkably they agree with those of Mr. Ravenshaw from Chuprah, in the sudden change of the wind, from ESE.—which we may call its average from the 1st to the 7th,—to SW. on the 8th. The subsequent changes seem to indicate, as before said, that the more direct current of the monsoon had for a short time forced its way upwards; for the remainder of the month the wind is variable from E. to W. with sultry weather, as usual there in the month of June.

| Date. | Winds. | Ther. | June, 1839.—Remarks, &c. |
|-------|-------------|-------|------------------------------------------------------------------------------------------------------|
| 1 | ESE. | 98 | Pleasant breezes, fair weather, 11 A. M. cloudy with a few drops of rain, hot and sultry. |
| 2 | ESE. | 98 | Light breezes, fair weather, not ind sultry. |
| 3 | ESE. | 99 | Fresh ditto, cloudy, at intervals hot and sultry; at 1/30 P. M. a squall, no rain |
| 4 | ESE. | 96 | Fresh breezes, cloudy at intervals, with hard squalls, fair weather. |
| 5 | ESbE. | 92 | A. M. cloudy and showery, hard gales with showers at intervals. |
| 6 | SEbE. | 86 | Hard gales, dark cldy. weather, showers at intervals, night rainy. |
| 7 | SEbE. | 86 | Ditto ditto ditto ditto with heavy rain, 7 P. M. wind shifted to the SW. |
| 8 | SW. | 89 | Dark cloudy rainy weather, with hard squalls of wind, 6 P. M. fair and continued during night. |
| 9 | SW. to ESE. | 80 | Morning dark, cloudy and fair, which continued throughout, 5 P. M. wind shifted to the ESE. |
| 10 | ESE. | 81 | At 3 A. M. dark and cloudy with drizzling rain, at 5 fair, moderate breezes. |
| 11 | WSW. | 88 | A. M. dark and cloudy, with thunder, lightning and rain, at 8 fair moderate breezes, passing clouds. |

GHAZEEPORE,
September 14th, 1839.

J. JACKSON,
Civil Surgeon.

* In the Northern parts of the district much more rain fell, both the Coosey and Mahanuddee were uncommonly high for the time of the year.

From Gorruckpoor, in lat. $26^{\circ} 45'$ N. long. $83^{\circ} 22'$ E. I learn by one letter that it blew a gale from the East on the night of the 5th and 6th June; strongly from the East during the 6th, and until the afternoon of the 7th, when it was NE., also blowing strongly; on the morning of the 8th it was NW. strong, and towards the afternoon it shifted to the East and moderated. The rain commenced at noon on the 6th and continued night and day till the afternoon of the 8th, when it ceased.

From Gorruckpoor I have also by the kindness of Mr. Vicars the following memorandum.

Gorruckpoor, 23rd September, 1839.

At the request of Mr. Bridgman, I send you an extract from my Meteorological Journal, it is a very unfortunate circumstance that I should have neglected to register the barometer and thermometer until the 7th of June, I however, noted the direction of the winds and the maximum of the Thermometer, which is better than nothing, and perhaps may answer your purpose; there was a storm from the East with rain on the 31st May.

Yours sincerely,

N. VICARS.

| Date | 10 A. M. | | | 1 P. M. | | | Remarks. | |
|------|----------|------------|-------|---------|------------|------|-----------------------------------------------|----------------------|
| | Bar. | Alt. Ther. | Dew. | Bar. | Alt. Ther. | Dew. | A. M. | P. M. |
| 1 | Max. | of | ther. | 91.4 | mm | 89.2 | Easterly, moderate, none. | Easterly. |
| 2 | Do. | .... | Do. | 91.2 | .... | .... | Easterly (minimum of Bar. 28.873) | None. |
| 3 | Do. | .... | Do. | 92.0 | .... | .... | Easterly, moderate. | Storm rain, no wind. |
| 4 | Do. | Do. | .... | 91.5 | .... | .... | Easterly, strong. | Easterly, strong. |
| 5 | Do. | Do. | .... | 88.0 | .... | .... | Easterly, showers. | Easterly, strong. |
| 6 | Do. | .... | Do. | 86.0 | .... | .... | Easterly, stg. hvy. rain (mm. of Bar. 28.808) | Easterly, strong. |
| 7 | 28.970 | .... | 81.0 | 28.750 | .... | 80.0 | Easterly, stg. rain all day. | Easterly, strong. |
| 8 | 28.788 | 77.5 | 78.5 | 28.777 | 79.5 | 77.8 | Easterly, strong, heavy rain till 1 P. M. | Easterly, strong. |
| 9 | 28.902 | 80.7 | 80.2 | 28.910 | .... | 81.0 | Easterly, strong, cloudy. | Easterly. |
| 10 | 28.961 | 81.0 | 81.0 | 28.800 | 82.8 | 83.0 | Easterly, cloudy. | Variable. |

From Mirzapore lat. $25^{\circ} 10'$ N. long. $85^{\circ} 35'$ E. I am indebted to Mr. Stuart for the following memorandum of the weather, from 1st to 10th June, 1839.

| | | | | |
|------------------------|----|----|----|----------------------------------------------------------------------------|
| 1st June, Thermometer, | .. | 88 | .. | Fresh Easterly Breeze. |
| 2nd ditto, | .. | 86 | .. | Morning wind Easterly. Noon dreadfully hot and blowing strong from the NW. |
| 3rd ditto, | .. | 90 | .. | Not a breath of wind, until 6 A. M. |
| 4th ditto, | .. | 88 | .. | Sultry night—strong Easterly wind. |

| | | | | | |
|-------------|----|----|----|----|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5th ditto, | .. | .. | 87 | .. | Blowing heavy from the East, showers, noon blowing very fresh and weather wild looking. |
| 6th ditto, | .. | .. | 80 | .. | A regular gale from the East with drizzling rain, noon gale increasing and more rain, evening stormy and wet. |
| 7th ditto, | .. | .. | 80 | .. | Severe squalls through the night from the East with heavy and incessant rain, noon blowing heavier, rained more Northerly, evening raining very hard. |
| 8th ditto, | .. | .. | 80 | .. | Very wet morning, cleared up about nine. |
| 9th ditto, | .. | .. | 80 | .. | Gloomy morning with distant thunder. |
| 10th ditto, | .. | .. | 80 | .. | Heavy Squalls through the night, torrents of rain, cleared up at 8 A. M. noon close, calm and sultry. |

My attention was drawn to this theory while endeavouring to trace some barometric curve, and some relation between it and the magnetic equator,* and withal some law which might theoretically account for the paraboloidal course of the West Indian and American hurricanes, as shown by Mr. Redfield and Col. Reid; and the singular difference shown by the track of our Hurricane led me to suppose that it might perhaps move in the axis of the parabola? Mr. Ravenshaw's letter shortly afterwards gave much credit to these views, and subsequent facts serve to justify our asserting that for this time at least it has done so.

If we describe, as I have done on the Map No. II, a great parabola, one branch of which stretches towards Ceylon, and the other up to the valley of the Ganges towards Agra, the vortex being towards Arracan. and the axis in the line of the supposed track of the Hurricane; it will be found that the focus of such a parabola falls in about lat. $19^{\circ} 36'$ N. long. $88^{\circ} 10'$ E. which was about the centre of the Hurricane on the 4th. These sort of lines are of course arbitrary, but still the coincidence is novel and curious; whether we look upon the whirls of the Hurricane to have been produced by the mere dynamic action of the streams of air, like the eddies within the bends of a river flowing through a curved channel, or suppose that these vortices are Thermoelectric Phenomena, produced by the sudden transfer of great volumes of the caloric and moisture of the stream of air from the warm equatorial regions to the colder ones toward and beyond the tropics. The remarks on the warmth of the weather in the logs, and the thermometrical

* It may be worth remarking that while this hurricane seems to have travelled from East to West or nearly parallel to the direction of the Magnetic Equator as laid down by Biot, those of the West Indies seem for the most part to come from the South Eastward, which is also there the direction of the plane of the Magnetic Equator. The "Raleigh's" Hurricane in the China Seas seems too to have travelled in this direction.

register, with the peculiar state of the atmosphere so well described in the remarks of Captain Paterson, of the H. C. S. *Amherst*—and her track from Akyab we must remember was almost in the direction of the path of the hurricane till it overtook her at the Sand Heads—are well worth considering.

These are but vague theories, it will be said, but it will not be forgotten that theories on a new subject, like torches in exploring dark caverns often lead us to the passage we seek ; though not by the road we expected. “We have only to be ready to lay them aside when they have served our turn,”* and if I venture to introduce this one here it is to point attention to the importance of obtaining electric observations if possible.

The slow rate at which the vortex appears to have travelled also seems to show, as before remarked, that it was, as it were, pent up between the great stream of air blowing along the Arracan range and the Coromandel Hills. We see analogous instances to this in the small bays at the sides of rivers, where while there is one part of the stream turning round the shores of it and another flowing from point to point, we see the eddies are from time to time found almost stationary about the middle of the bay.†

I wish to be understood here however as suggesting probable comparisons rather than advancing a theory.

Col. Reid and Mr. Redfield give from ten to thirty miles per hour for the rates at which the centres of their different vortices have probably travelled onwards. If our centres are correctly laid down ; and I think there is good evidence that at least those of the 4th and 5th are so ; it appears that from the 3rd to the 4th the Hurricane travelled onwards only about 100 miles, or say 4-16 per hour, and from the 4th to the 5th about 70 or 83 miles per hour. This again is conformable to what we observe in the bends of a stream where the eddies seem to start from some point, and move onwards with more rapidity in the first part of their course than latterly. Should future experience confirm this instance of the slow progress of our Hurricane, it will become an important element in any calculation to be made by the seaman for avoiding their violence.

* Sir John Herschel.

† In the rivers of India banks are often formed at these points, which ending by choking the stream as the river becomes lower, changes its channel in succeeding years

Practical Remarks and Deductions.

I have quoted at p. 563 an opinion expressed in my hearing, that it was thought by the individual that "they would not make much of it." Few I think who have perused the preceding pages, will be inclined to repeat this, but still as the plain man and the practical seaman may not so readily arrive at *all* the conclusions to be drawn from the knowledge we have collected of this single tempest, I have been induced to sum them up here.

My original intention was to delay doing this, and even the publication of this memoir, until I could collect also what was to be gleaned from the records now existing of our former gales and hurricanes, and then accompany the whole with practical deductions; but it was suggested to me by Professor O'Shaughnessy, that by the delay which this would occasion, we should loose the opportunity of exciting public attention to the subject before the approach of the autumnal gales, and moreover, that even by publishing our knowledge in this yet imperfect state, we might nevertheless, possibly, avert mischief. This I thought sound counsel, and therefore propose to make our former Indian tempests the subject of a future memoir.

It will then be recollected that what is here said is merely the amount of our *present* knowledge, and that what is said is rather meant as a suggestion than as a rule. I shall however distinctly state the grounds from which the various inferences are drawn, and it will be for every man to exercise his own judgment thereupon; I shall also acknowledge when I borrow from Colonel Reid, or other writers.

Clearly to comprehend this theory of gales and hurricanes, let us begin with the *words*. As I have elsewhere said, the words are not to be used so much with relation to the force of the wind in a storm, as to its motion.

A *storm*, or tempest, may mean either a Gale or Hurricane, but it always means a storm of *wind*, and not, as frequently used by landmen, one of thunder and lightning only; unless so expressed.

A *gale* means a storm of wind, the direction of which is tolerably steady for a long time, sometimes not only for days but for weeks.

A hurricane means a *turning* storm of wind blowing with great violence, and shifting more or less suddenly, so as to blow half or entirely round the compass in a few hours.

With this explanation of our words we shall better understand the things treated of.

The present state of our knowledge seems to show that for the West Indies, Bay of Bengal, and China Sea, the wind in a hurricane

has two motions, the one a turning or veering round upon a centre, and the other a straight or curved motion forwards, so that it is both turning round and rolling forward at the same time. It appears also that it turns, when it occurs on the North side of the Equator from the East, or the right hand, by the North, towards the West ; or *contrary* to the hands of a watch ; and in the Southern hemisphere, that its motion is the contrary way, or *with* the hands of a watch. The foregoing memoir with the charts and diagrams shew that this rule holds good at least for our storm of June last ; and that the wind was really blowing in great circles in a direction as described ; i. e. against that of the hands of a watch. We assume then for the present, that the hurricanes in the Bay of Bengal *always* follow this law. We do not yet positively *know* that such is the case, but it is the most probable opinion.

If we describe on a piece of paper a few concentric circles, like those in the diagrams, and marking a little compass with its *fleur de lis* to the North in the middle make four arrows at the top, bottom, and two sides, writing against them as in the diagram, East-wind, North-wind, West-wind and South-wind, and then cut this out with scissors, we shall have what is called a *Hurricane-circle* or *Hurricane-card*.

The use of this is to lay it down upon any part of a chart. We may also cut out a little spindle-shaped piece to represent our ship, and place this in that quarter of the card at which the wind is found.

The card may be supposed to represent a circle of fifty or of five hundred miles in diameter, as we please ; and one which would fill up the head of the Bay of Bengal would show, on our map No. II, the wind South on the Arracan coast, East at the Sand-Heads, North on the coast of Coromandel, and West across the Bay.

We have now to judge of three important points, What is the track of the hurricane if it is to be one ? In what direction does it bear from us now ? How far are we from its centre ?

We do not yet know what is the usual track of our Indian hurricanes. We know from Col. Reid's and Mr. Redfield's researches that those of the West Indies begin about the Leeward Islands, travel to the WNW. and then round the shores of the Gulf of Mexico, and following the Gulf Stream, are lost in the Atlantic between the Bermudas and Halifax ; and they have investigated a sufficient number to show that this may be taken as a general rule. Those also of the Mauritius seem to come from the Eastward. All we yet know positively here is the course of this single tempest ; and hence the great necessity of further observation and research, to which I shall perhaps farther allude. We may however, in the absence of better knowledge, take it as

a supposition, that the hurricanes in the Bay of Bengal travel from the Eastward to the Westward,* and it may be quite safe to calculate upon their blowing in a circle from right to left.

We must then *assume* this point, and supposing we have the wind at ESE. we are then *somewhere* upon the line leading from the NNE. point of the hurricane-circle to its centre.

If the wind now veers to SE. and SSE. we can easily understand that the centre has passed somewhere to the Southward of us, and that we are upon the *right* hand side of its track.

But if the wind had begun at North, and veered to the N. West and West we can also understand that the hurricane is passing somewhere to the Northward of us, and that we are upon the *left* hand side of its path. At what distance we are from the centre can only be judged of by the quickness with which the wind veers round; and it will be clear that if a ship stood exactly still with the hurricane coming direct towards her, she might have the wind always in one direction till the centre passed her, when she would probably have a shift exactly in the opposite direction.†

The seaman will now understand how it is that he may be running into a Hurricane or scudding in company with one—which no one of course desires to do—and how important it is that a knowledge of their usual paths should be obtained; for they seem to have in all countries tracks which we may call their usual paths.

As an example how a vessel may run into a hurricane, let us suppose upon our Chart, the Amherst, bound across the Bay from Chittagong to Coringa. It is clear that her course then lies across the track of the Hurricane, and that, if ignorant of what we now know, she might with a little alteration of time, and tempted by the fine Easterly Gale, run into the middle of it; for till now, though a falling Barometer would teach the seaman that he was to expect a tempest, he was quite ignorant, or had only some general rules derived from very partial experience, to inform him where it was beginning, how it would blow, and how he could escape it. We shall know this as I have said before, when we know the usual path of our Indian Hurricanes.

* In an able review of Col. Reid's work in No. 23 of the *Madras Journal of Literature and Science* by T. G. Taylor, Esq. H. C. Astronomer at Madras, he says, "The East India Gales appear invariably to travel from the coast of Arracan towards the West, the curves conforming gradually to the slope of the shore until in about the latitude of Madras when their course is due South, after which the curve bends again towards the West, the violence of the storm seldom extending below Cuddon or Porto Novo." Mr. Taylor speaks here of a *gale*. He does not observe that he has described the curve which a hurricane (i. e. a turning gale) would make on three sides of its circle.

† Col. Reid, p. 8

The question of scudding or heaving to must it is evident depend upon the commander's judgment as to the position in which he is, his sea-room and the like; but the tack on which he ought to heave to is so clearly indicated by Col. Reid's directions that I cannot do better than extract them; he says page 425,

"*Rules for laying Ships to in Hurricanes*—That tack on which a ship should be laid to in a hurricane has hitherto been a problem to be solved; and is one which seamen have long considered important to have explained.

"In these tempests when a vessel is lying to and the wind veers by the ship's head, she is in danger of getting stern-way* even when no sail is set; for in a hurricane, the wind's force upon the ship's masts and yards alone will produce this effect, should the wind veer ahead, and it is supposed that vessels have often foundered from this cause.

"When the wind veers aft as it is called, or by the stern, this danger is avoided, and a ship then *comes up* to the wind instead of having to break off from it.

"If great storms obey fixed laws, and the explanation given of them in this work be the true one, then the rule for laying a ship to follows like the corollary to a problem already solved. In order to define the two sides of a storm, that side will be called the right hand semicircle which is on the right of the ship's course, as we look in the direction in which it is moving, just as we speak of the right bank of a river. The rule for laying a ship to will be, when in the *right-hand* semicircle to heave to on the *starboard* tack, and when in the *left-hand* semicircle on the *larboard* tack in both hemispheres."

As an example of this on our own diagram. If a line be drawn across those of the 4th and 5th N. 76° E. and S. 76° W. or about WbS. $\frac{1}{2}$ S. and EbN. $\frac{1}{2}$ N., which is the track we have supposed for the hurricane; it will be seen that all the vessels above it, or to the right hand of the hurricane's path, had the wind veering from NE. to South, and were thus safe upon the starboard tack, and all

* From being taken aback. This taking aback in a tempest we all know to be most dangerous, not only on account of the getting stern-way here mentioned; being pooped, dismasted, and the like; but from another danger which is not sufficiently adverted to I think, and this is, that a vessel, may in one of the terrific gusts which accompany these sudden shifts of wind be thrown on her broadside in the trough of the sea *with her deck towards the sea!* In such a case she is in the position of a vessel on a reef which has fallen over to seaward; and there is every chance that her hatches would be beaten in; which would swamp her. A parallel case to this is mentioned in Col. Reid's work, page 221, of the H. C. S. Diana, when part of the upper fore-hatchway was stove in by the weight of the water above it, and the vessel nearly swamped in consequence. Hatches, particularly those of the upper deck, should not only be made stouter than they usually are (they might for lightness be lined with sheet copper or iron) but moreover two extra strong fore and aft-pieces should be made to ship parallel with the middle piece, halfway between it and the side, so as to afford additional support in cases like this. I shall be told that we know of very few instances of this accident. This may arise from few escaping to tell the tale. The number of well-found, stout ships, ably manned and commanded, which disappear induce us to believe that, apart from fire, there are storm-dangers which we can only guess at. I think this may reasonably be supposed to be one of them. H. P.

those below it,* or on the left hand side, had the wind veering from N. to SW. and were thus safe on the larboard tack. The vicinity of the shore, or the necessity of wearing to ease the masts, if the rigging has stretched too much upon one tack, may oblige the seaman to vary from this rule; and close to the centres of the hurricanes anomalies may be found; but it will be seen at once, I think, without further explanation, of what great value it must ultimately prove to him.

I annex here a public order recently issued by the Government of India, and a memorandum by the Lords of the Admiralty and by Lord Glenelg, which will assist in shewing both the seaman and landsman what we require in the way of information on this subject.

Calcutta: Wednesday, 11th September, 1839.—NOTIFICATION.—The importance of investigating the course and Phenomena of Storms has been brought to the notice of Government by the Hon'ble Court of Directors; and the Hon'ble the President in Council is in consequence desirous of obtaining local Registers of these Phenomena taken simultaneously at as many stations of India as may be found possible. The public Officers of the different settlements and stations of India are accordingly invited and requested, upon the occurrence of any Hurricane, Gale or other Storm of more violence than usual, to note accurately the time of its commencement, the direction from which the wind first blows whether in gusts or regular, and whether accompanied with rain, thunder and lightning or other Phenomena. Also to note, with as much accuracy as possible, the changes of direction in the wind, and the time of the occurrence of each and lastly, the duration of the Gale and in what quarter the wind is when it ceases. The variations of the Thermometer and Barometer at each period noticed will also be of importance if the means are forthcoming of making such observations.

The President in Council refrains from making it the business of any particular Officer to note the above circumstances, but relies on the known desire of all enlightened persons to promote objects of scientific and useful enquiry that the public Officers will arrange in such manner as to ensure that the observations will be taken by some one in the vicinity of each station.

Reports upon matters of the description comprehended in this Order may be forwarded to the Secretary to Government in the General Department, free of postage, (superscribed "Storm Report.")

A scientific gentleman in Calcutta has obligingly undertaken to combine all reports that may be so received into a synopsis for exhibition of the results in the manner adopted and recommended by Colonel Reid, R. E.

By Order of the Hon'ble the President of the Council of India in Council.

H. T. PRINSEP,
Secy. to the Govt. of India.

* The places of the Justina and Eden, by an oversight, are unfortunately omitted in the diagram of the 5th. It will be seen that they had the wind at SW. and SWbW. on that day.

MEMORANDUM.

Admiralty, Dec. 28th, 1838.

The Lords Commissioners of the Admiralty having had under consideration the general utility of recording with clearness and precision, in the log books of all Her Majesty's ships and vessels of war, the actual state of the winds and weather, have thought fit to order that henceforward in each page of the log book two columns should be introduced, wherein the force of the wind and the appearance of the atmosphere, shall be every hour registered according to the annexed scheme, a copy of which shall be pasted into each book, and painted on the back of every log board or log slate: and two more columns shall likewise be given for the purpose of entering the heights of the barometer or simpiesometer, and thermometer, when such instruments may be on board.

By command of their Lordships,
C. WOOD.

To all Captains, and commanding officers
of Her Majesty's ships and vessels.

FIGURES TO DENOTE THE FORCE OF THE WIND.

0 denotes Calm.

1 Light Air, just sufficient to give Steerage way.

2 Light Breeze, .. } with which a well-conditioned man-of-war, under all sail, and clean full, would go in smooth water, from { 1 to 2 knots.

3 Gentle Breeze, .. } 3 to 4 knots.

4 Moderate Breeze, } 5 to 6 knots.

5 Fresh Breeze, .. } Royals, &c.

6 Strong Breeze, .. } Single-reefs and top-gallant sails.

7 Moderate Gale, .. } Double reefs, jib, &c.

8 Fresh Gale, . . . } Triple reefs, courses, &c.

9 Strong Gale, .. } Close reefs & courses.

10 Whole Gale, .. with which she could only bear Close reefed main top-sail and reefed fore-sail.

11 Storm, with which she would be reduced to .. . Stay-sails.

12 Hurricane, .. to which she could shew .. No canvas.

LETTERS TO DENOTE THE STATE OF THE WEATHER.

| | | | |
|---|-------------------------------------------------------------------------|---|-----------------------------------------------------------------|
| b | Blue sky—whether with clear or hazy atmosphere. | p | Passing showers. |
| c | Cloudy— <i>i. e.</i> Detached opening clouds. | q | Squally. |
| d | Drizzling rain. | r | Rain— <i>i. e.</i> Continuous rain. |
| f | Fog— <i>f</i> thick fog. | s | Snow. |
| g | Gloomy dark weather. | t | Thunder. |
| h | Hail. | u | Ugly threatening appearance in the weather. |
| l | Lightning. | v | Visibility of distant objects—whether the sky be cloudy or not. |
| m | Misty or hazy—so as to interrupt the view. | w | Wet dew. |
| o | Overcast— <i>i. e.</i> The whole sky covered with one impervious cloud. | . | Under any letter denotes an extraordinary degree. |

By the combination of these letters, all the ordinary phænomena of the weather may be recorded with certainty and brevity.

EXAMPLES.

b c m Blue sky, with detached opening clouds, but hazy round the horizon.

g v Gloomy dark weather, but distant objects remarkably visible.

q p d l t Very hard squalls and showers of drizzle, accompanied by lightning, with very heavy thunder.

Nautical Magazine,—March, 1839.

Memorandum respecting the Records to be kept of the state of the Weather in the British Colonies.

The Captains of Ports, Harbour-Masters, and Keepers of lighthouses, or, where those officers do not exist, some other competent public functionary, should be required to keep journals of the weather, on the principle of the log books of ships. A column should be specially reserved for inserting the height of the barometer. Under the head of 'Remarks,' should be entered all meteorological observations considered worthy of particular notice. When the keeper of a journal may hear that a vessel has encountered a storm, he will enter in it any information on the subject which he can rely on, together with the name of the ship, of her owner, and of the port to which she may belong. With the view of tracing the course of storms, the Trinity Board of London have given directions for the adoption of measures to obtain a more accurate record of the weather, than has hitherto been kept, at the lighthouses of Great Britain and Ireland. The keepers of these lights having the opportunity of taking their observations by night as well as by day, great advantage may be derived from employing them in this manner. Officers in charge of Colonial lighthouses should be instructed to keep similar journals. In noting the wind's force, both in the Harbour-Master's journals and in the lighthouse reports, it is desirable that the officers should adopt the numbers for

noting the strength of the wind now in use at Greenwich Observatory, and about to be introduced at the lighthouses under the Trinity Board. In the cases of St. Helena and Ascension, it is desirable that more precise information should be obtained by observation, respecting the 'Rollers' at those islands. As the object of H. M's. Government in instituting these inquiries is the advancement of knowledge in science generally, the Governors of the several British Colonies will consider how far it may be in their power to obtain useful information bearing on the subject, from countries adjoining to their Governments in the possession of foreign powers, or how far it may be useful to the study of meteorology, to exchange the observations made within their Governments, for those of other countries in the neighbourhood. If at any time desired, there would be no objection to the publication in the Colonial newspapers of extracts from the journals.

(Signed) GLENELG.

There is little to be added to these ample directions, but I may be allowed here to repeat what has been said in another place,*—that every European in India, may be said to have a direct personal interest in this matter; for, though unconnected with commercial speculations, he probably looks one day to cross the ocean himself on his return home; or has those who are dear to him doing so; or he may be sent to sea for his health. It is superfluous to allude here to that general interest which the feelings of humanity must awaken in every man's mind when he hears of a new branch of knowledge, which may so much contribute to disarm the tempest of its terrors; and which careful, common-sense accounts of storms may so very essentially assist us in perfecting.

In closing this first memoir, which, in the absence of abler labourers in the field, I propose to follow by others as I can find materials, I ought to apologize for its imperfections. I have mentioned in Part I. some of the difficulties I experienced in collecting information, and that, by the advice of a friend, I published earlier than I originally intended, to attract attention to the October Gales. When I add to this, that I am far from being master of my own time, I trust due allowance will be made for its defects, by those who are not aware of these circumstances. To solicit information on any question of natural history is often fruitless enough in all countries, but upon meteorological questions, and in India, where the public mind has not yet been roused to attention on this head, and where observers are so few, is absolutely at times, to use a Gallicism, *désespérant*. I trust however this little essay will shew how much every trifle, insignificant as it

* Englishman, 17th September, 1839.

might be thought by the possessor, may contribute to the end we seek. Mr. Hudson's valuable barometrical observations on board the Hope Floating Light, I have alluded to at p. 589; and I may state here, that those of the Hurricane of October, 1832, quoted by Col. Reid p. 269, as taken at Chandernagore, are my own; and both prove to be of far more utility than was at the time supposed by the observers. We may indeed, if allowed to speak metaphorically on such a subject, say, that as the great pyramids of human knowledge must be built of separate stones, no man can say, before he brings his to the builder, that it may not become "the head stone of the corner!"

ART. III.—*Extracts from Mr. M' Clelland's paper on Indian Cyprinidae. As. Res. Vol. xix. Part II.*

For such of our readers as do not subscribe to the *Researches* of the Society, we take this opportunity of extracting such parts of the 2nd part of the 19th vol. just published, as may be separated, without disadvantage from the rest of Mr. M' Clelland's paper. The utility of Ichthyology is set forth in the following remarks.

"Utility will always be found to depend more on the degree of attention paid to any subject connected with science, than on the nature of the subject itself; yet it is a common remark that this, or that, is important or frivolous, according as we happen to be acquainted with it. When we find any branch of science regarded as useless, we may be assured that, contrary to ordinary expectation, it will prove the most productive field we can enter. Science, indeed, can only be useful where it has been cultivated, and its principles worked out; practical results will then follow in proportion to the pains taken to develop them.

"The moral interest of Ichthyology having been sufficiently attended to throughout the preceding paper, I shall here pass it over, merely remarking, that in common with other branches of natural science it is calculated to improve the mind as well as the condition of society, while its cultivation need not interfere with any duty, public or private; and few who are placed on our coasts, or on the banks of any of the noble rivers of India, who might not with amusement to themselves, and advantage to science, communicate many observations no-

where else to be collected regarding our indigenous species. The season of spawning, and places to which the various species resort for this purpose—their food—the kind of waters in which they thrive best—whether running or stagnant—with sandy or with muddy bottoms,—would all be points of great interest that might be settled by persons of no pretensions to a scientific knowledge of the subject.

“With regard to the propagation of fishes, Mr. Yarrell remarks—that an acre of water will let in many parts of the continent, where fresh water fishes are in more request than in England, for more than an acre of land. In no part of the continent of Europe, however, can fresh-water fish be of so much importance as in India, where most of the domestic animals which in Europe afford the principal food, as the ox, swine, poultry, &c. are rejected by a large proportion of the people.

“Throughout the Mysore country, as well as in many of the western provinces, large tanks or reservoirs occur, many of them from three to thirty miles in circumference, and being indispensable for irrigation, may be supposed to be nearly universal in all populous districts not watered by rivers. These reservoirs are considered by the Hon’ble Colonel Morison C. B.* as among the greatest national monuments to be found in India.

“They are capable, according to Buchanan,† of supplying water for from eighteen months to two years, and thus of maintaining the surrounding crops should no rain fall within that period.

“They are drained by an ingenious system of sluices and aqueducts of the most simple, but complete construction, which afford a perfect control over the distribution of the water. During the dry season they are all pretty much exhausted, and may, if necessary for repairs, be left perfectly dry. This would afford an excellent opportunity for destroying crocodiles and all the various destructive fishes, sparing only the more profitable kinds, which are limited to two or three species only; and by repeating this operation for several seasons, or as often as may be necessary, all but those we wish to propagate would soon be exterminated.

“By a wise law of nature, the carnivorous animals of every class are less prolific than the harmless, and may therefore be the more easily subdued. Nearly all the destructive fishes are viviparous, bringing

* To whom I am indebted for many particulars regarding them.

† See his *Journey in Mysore*.

forth comparatively few young ; whereas, the more profitable kinds, or those which should be the object of our care, are all oviparous, and bring forth their young from spawn.

“ A single female Carp weighing only nine pounds has been found by Bloch to contain no less than six hundred thousand ova ; and by Schneider, one, ten pounds weight, was found to contain seven hundred thousand ova, or eggs.

“ The fecundity of the *Ruce*, *Catla*, and *Mrigala*, has not yet been ascertained, but from their close affinity to the Carp we may suppose them to correspond in this respect with that species ; the question however, is one that may be easily ascertained by weighing a grain of the roe and ascertaining the number of globules it contains, while these will be to the whole roe what one grain is to its entire weight. The result will show that these species are capable of yielding, by their extraordinary fertility, a source of food as inexhaustible as the sands of the ocean, could we only bring their propagation and the safety of the young sufficiently within our control.

“ In the reservoirs above described, we have every facility for effecting this object on a scale of great magnitude, without in any way interfering with the other uses of the water.

“ There are certain kinds which though they cannot be said to be carnivorous, would yet be still more fatal to our object by devouring the spawn or ova, such are the Barbels, common in the higher parts of our rivers, and which but for a knowledge of this trait in their character would, from their appearance and flavour, be the first we should recommend for propagation, and thus from an ignorance of one simple fact, destroy every chance of success. We should not, however, condemn all the Barbels merely from a fault in some of the species, the circumstance should impress on our minds the necessity of confining the varieties of fish in a single reservoir to the lowest possible number of herbivorous kinds, such as the three I have mentioned, namely, *Cyprinus rohita*, Buch. *Cyprinus catla*, id. and *Cyprinus mrigala*, id. ; there is reason to believe that either of these species would answer equally well in any part of the plains of India. As they usually attain a large size, they may be slow in coming to perfection, and, therefore, instead of having these three large species in the same water, it would probably answer the purpose better to have one of them only as a principal species, with any one of the common Gudgeons or Bangons of India as a cheaper article, which would

not require more than a year or two at the utmost to arrive at perfection. Beyond a single species of *Gobio*, and a single one of the larger species already mentioned, more ought not to be introduced to the same water, or allowed to exist in it, from the danger of their proving inimical to each other, a point which I presume has never been attended to sufficiently in attempts hitherto made to propagate fishes; hence, perhaps, the want of that degree of success which no doubt would have rendered a practice so simple and beneficial, long since universal.

“The only alteration in the present form of the reservoirs, to adapt them to the purposes in view, would be to enclose the lowest portions of the bottom of each with stakes long enough to reach above the highest surface of the water, and close enough together to prevent the entrance of crocodiles, otters, and the like, should any such exist in the neighborhood. The spawning season of the *Ruee* and other *Cirrhi*ns, appears to be in the dry weather; the contrivance here suggested would therefore protect them at that time, and if there should be any danger of the whole of the water drying up, wells of sufficient size and depth might be formed within the enclosure, to which the fishes would retire during droughts, while the shallow waters around the wells would afford space enough for the deposit of spawn.

“Much of our success would depend on keeping these enclosures as free as possible from all but the species we desire to propagate. At the commencement of the dry season, before the fish begin to enter the enclosure, the interval between the stakes might be closed with straw, and as the water becomes sufficiently low without, most of the rapacious kinds may be removed or destroyed; none should be allowed to remain, but that species alone which may be the object of our care. This done, the only further attention necessary, would be to save the fish in the enclosure from birds during the remainder of the dry season.

“Should our success be complete, from every moderately sized female *Ruee* we should have on the commencement of the rains from five to ten hundred thousand fry, which, as the waters rise would be quite able to take care of themselves till the next season, when it would be necessary again to destroy the rapacious kinds, as before.

“The repair of the *carays** of Mysore, is said by Buchanan, to be

* Such is the name by which the reservoirs are known in Southern India when kept up for irrigation.

attended with considerable expense, nevertheless it is understood to be an indispensable object to have them in perfect repair, since the fertility of the country depends entirely on them. The plan here proposed of converting them to new purposes of utility would add to their importance, and the interest of keeping them up, without in any way increasing their expense.

“On the fishes of Bengal, Assam, and other provinces subject to the inundations of the larger rivers, we can exercise no control, nor is it desirable that we should, even if it were in our power, the supply of fish being plentiful and constant enough: but in the higher parts of the plains, near the foot of the mountains where the larger Cirrhins and Barbels retire during the dry season for the purpose of spawning, fisheries might be carried on with advantage to a considerable extent.

“It would here be out of place to enter on the subject of sea fisheries, and before we could do so with advantage it would be necessary to pay as much attention, or more, to the fishes of our coasts as we have devoted to those of our rivers.

“Already we have attained one important piece of information regarding the value of the *Sudea* fish of our estuaries, *Polynemus sude*, Buch., which from the earliest times has been celebrated throughout China for its isinglass. This substance was formerly supposed to be afforded only by certain fishes in the rivers of Muscovy, from whence it was exported to all parts of Europe, where, from its high price, its use is chiefly confined to the arts.

“A solution of this substance mixed with Canadian balsam and spread on black silk forms the useful article called court plaster. A few grains of isinglass boiled in milk forms a most nutritious food, which is given medicinally.

“Ignorant of its abundance in certain fishes of the Hoogly, that used by the English residents in India is still imported, probably at an expense of about 800 Rs. per maund,* while the same thing is collected in abundance and shipped to China from the Calcutta river.†

“Ten grains of this substance is sufficient to give the consistency of jelly to a pint of water, and as it keeps good in a dry state for any length of time, we may imagine its value as a portable food, and what its importance might be in times of scarcity, since one pound avoird-

* It is retailed in Calcutta at a much higher rate.

† See Journal of the Asiatic Society for March, 1839.

dupois, at the above rate, would afford a nutritious meal to 1560 persons.

“ Whether it be used in times of scarcity in China I do not know, but probably it is collected and stored to meet such occasions, since Dr. Lumqua—an honorary member of this Society—a Chinese Physician, long resident in this city informs me that the Bengal *fish-sago* procured from *Polynemus sele*, Buch. is known throughout the empire, and that nothing could surpass his surprise on his arrival nearly twenty-five years ago in Calcutta, when he found that with the exception of his own countrymen who carried on the trade, no one appeared to know or care anything whatever for the article in question, and as no one could describe the fish, the same ignorance continued up to within the last few months to prevail on the subject. The advantage, however inconceivable, of an abundant supply of any substance, a single maund of which would afford a nutritious meal to upwards of one hundred thousand persons, could only be felt occasionally, but the intrinsic value of the article in all the common conveniences of life, is eminently calculated to direct attention to other uses of the species affording it.

“ This is one of the largest and finest fishes, both as regards flavour and wholesomeness, on our coasts or in our rivers, while the season at which it is taken is the one most favourable for a residence in boats or ships in the Sunderbuns. Under these circumstances it is not likely that the subject of sea fisheries in this quarter will be altogether overlooked, longer than the circumstances on which their success must depend shall have been properly examined.

“ All sea fisheries are practised on migratory species, which advance annually at stated periods in search of food and proper situations to deposit their spawn. Their progress is so regulated that at certain seasons they approach the different coasts, in their course, with so much regularity as to enable the people to repose as much confidence and hope in their coming and departure as they usually place in the ripening of their crops. The shoals of fishes are so dense as to cover the sea for leagues without interruption, and extend to a solid depth of many fathoms in some instances, so that they are taken as quickly as it is possible to salt and barrel them. The season lasts from a month to six weeks, when thousands of ships are laden with cargoes which are to serve as the common stock of food for many of the surrounding nations for twelve months, when the fishing is recommenced.

“ Such are the fisheries on the banks of Newfoundland, on the coasts of Norway, Sweden. and Great Britain : and unless the coasts of India

afford promise of resources of similar extent and importance, the object would hardly require much public attention. If, however, it be found that we have species on our coasts equal in every respect to that which is the object of enterprize at Newfoundland, and that these advance into the Sunderbuns at a season when ships and men without number may be employed with safety, there can be nothing to prevent the national importance of the circumstance.

“In this instance, as well as in that of the propagation of fresh-water species, science, while it exhibits varieties as numerous almost as the stars, teaches us at the same time how to strip the subject of vagueness arising from this cause, and amidst the countless species which inhabit our seas, directs our attention and our energies to a few only, and of these the *Sulea*, or *Polynemus sele*, Buch. is the one which from its bulk, its habits, and its qualities in every way seems capable of becoming a permanent benefit to society. It appears to be the Cod-fish of the tropics, and equals its representative in the northern seas in all those qualities which render that species so invaluable; but from its bulk it is unmanageable by the Indian fishermen, who are also without the means of preserving it.* These however are not sufficient reasons why an article that might add an exhaustless supply to the common stock of food should be altogether lost, now that an European spirit, under the influence of a paternal government, begins to infuse itself in all things connected with the resources of India. *As. Res. vol. 19. p. 457—464.*

* It must have been long known that the difficulty of preserving meat depends more on the state of the atmosphere in regard to electricity and moisture than on temperature. In Calcutta, in the month of December, when the mean temperature is about 60°, it is not uncommon to keep meat before it is dressed for eight days, though in England during the summer at the time of herring fishing too, it cannot be kept in the best meat-safes for more than half that time, though the temperature be lower than here. With salt and other means at hand, I conceive there would be no difficulty in curing fish in an Indian climate in the months of November and December, when the *Sulea* fishing would be carried on; nevertheless the subject is one of much interest, and I cannot therefore omit the following remark with which I have been favoured on this head by Mr. C. K. Robison, one of the Magistrates of Calcutta. “It would be a famous thing if these enormous fish (the *Sulea*) could be cured, as well as their isinglass obtained; and I cannot help thinking the measure very feasible, if the fishermen at the time of taking them and cutting them up, dipped them first into weak chloride of soda mixed with a small quantity of impure pyroligneous acid. This would not only preserve the fish till the salt acted, but improve the flavour.” These materials could be manufactured at a very cheap rate on the spot, as well as every thing else that would be requisite. For an account of the *Sulea* fish, see *Journal Asiatic Society Bengal*, March 1839, p. 203. Also an article on “some Indian Fishes by Dr. Cantor,” *Proceedings Royal Asiatic Society*, April 1838. *As. Res. vol. 19. p. 461.*

"*Cyprinidæ*, of all fishes of equal importance are those that appear to have occupied least, the attention of naturalists; a circumstance the more curious, as in consequence of their being peculiar to fresh waters, they are more universally distributed in the interior of continents, where they ought to be more familiar and useful to man than any other family of the same class.

"Regarding their distribution, little has hitherto been made known. It would not appear that there is any one species common to Europe and America; it is not however to be supposed that we are yet prepared to form an accurate comparison between the *Cyprinidæ* of the old and new worlds, since the majority of species in either seems as yet to be but ill defined. Nor is it to be supposed that ichthyology has yet been prosecuted in America to an extent at all likely to make us acquainted with the numerous species that must inhabit the extensive lakes and rivers of that continent. Of African species few only are referred to by Cuvier, while the Nile is known to present some species that are not found in the south of Europe. The Chinese species may yet be said to be almost unknown, with the exception of a few determined by Cuvier from the very doubtful data afforded by paintings; although it is seldom that so favourable an opportunity is afforded for collecting information on any branch of natural history, as that which the British embassies in China possessed, for investigating the peculiarities of the fresh-water fishes of that empire, from the length of time they passed in boats on some of the principal rivers. Nor is any thing whatever known, as far as I am aware, of the existence of Cyprins in New Holland or any of the Polynesian Islands. In India the fishes of several of the great rivers yet remain to be investigated, as those of the Irrawaddi, the Indus, and the Nerbudda. A collection of drawings of the fishes of the Indus, prepared during a scientific mission under Capt. Burnes, has recently been deposited in the museum of the Asiatic Society; and Mr. Griffith, to whom every branch of science is as dear as the one in which he is fast rising to the highest station, is now engaged in making extensive collections of, and observations on, the fishes of the same river. The museums of Paris must already be well stored with Indian species collected by Messrs. Duvaucel, Jaquemont, and De-Lessert, but I doubt if any of our British museums contain many of the commonest species of the Ganges.

"Natural history is now assuming a station so important in the highest scale of intellectual pursuits, that any remarks at all calculated to impress on the minds of those who are connected with missions into

new countries a lively sense of the interest that attaches to its most minute details, will not, we may be assured, be taken amiss. Information however carefully collected on such occasions as those referred to, becomes comparatively useless when unaccompanied with specimens of the things to which it relates. We should ever recollect that the easiest and best way to promote our own fame, and contribute at the same time to the advancement of natural history, is by making collections, nor are we without examples of the highest awards having been, though somewhat prematurely, conceded to collectors. Nevertheless, to render collections of the highest degree of real value in the present advanced state of science, those who make them should gather at the same time as much information as possible regarding the circumstances under which the various objects comprised in them live, or occur; and it is in this that the intelligence of the naturalist may be best and most profitably displayed during his journies in new countries.

“The following tabular view of the distribution of *Cyprinidæ*, though avowedly imperfect, will serve to show how the leading groups are generally dispersed. Cirrhins, for instance, appear to be peculiar to India, or at least to the tropical parts of Asia, and the Catastoms to America; while both are represented in Europe by the true Carps. From the number of Gangetic species, the Barbels like the Cirrhins would seem to have their metropolis in India, from whence the genus is extended over the Caspian Sea, and the Nile into Europe.

“The Gonorrhynchs would also seem, as a group, to be natives of the East, one species only having been found in South Africa, none in Europe, and eleven in India.

“The greater part of the *Sarcoborinæ* are probably also Eastern fishes, with the exception of the Brems and Lenciscs, although some of the European forms set down under the latter genera may be found to belong either to the Perilamps or Opsarions.

“The small sub-genera of *Pæcilia* appear to be equally distributed in all parts of the world, one having been already found in Africa, two species in India, where a few more may be expected, seven species in America, and seven in Europe; but in every case the species of one continent have been found to be distinct from those of another.

“The Loaches (*Cobitis prop.* Lin.) afford another instance of the concentration of numerous species in India, while three only are found in Europe, and none whatever in America. The annexed table exhibits the general distribution of the family.

GENERAL VIEW OF THE DISTRIBUTION OF CYPRINIDÆ

| | | | | ASIA. | | | | | | | |
|------------------------|----------------------------|----------------------------------------------------------|----------|---------|----------|--------|--------|----------|---------|------------|--------|
| FAMILY. | SUB-FAM. | GENUS | SUB-GEN. | EUROPE, | AMERICA, | INDIA, | CHINA, | CASPIAN, | AFRICA, | UNCERTAIN, | TOTAL. |
| CYPRI- NIDÆ Cuv. | PÆONOMINÆ McClell. | Cirrhinus Cuv. | | — | — | 13 | — | — | — | — | 13 |
| | | Labeo Cuv. | | — | 2 | 1 | — | — | — | — | 5 |
| | | Catastomus Leseur, | | — | 19 | — | — | — | — | 1 | 19 |
| | | Barbus Cuv. | | 4 | — | 11 | — | 2 | 1 | — | 18 |
| | | Oreinus McClell. | | — | — | 4 | — | — | — | — | 4 |
| | | Cyprinus prop. Cuv. | | 6 | — | 4? | 4? | — | — | — | 14? |
| | | Gobio Cuv. | | 2 | — | 16 | — | — | — | — | 18 |
| | | Tinca Cuv. | | 1 | — | — | — | — | — | — | 1 |
| | | Gonorrhynchus Gron. | | — | — | 10 | — | — | 1 | — | 11 |
| | SARCOBORINÆ McClell. | Systemus McClell. | | — | — | 12 | — | — | — | — | 12 |
| | | Abramis Cuv. | | 5 | 1 | 1 | — | — | — | — | 7 |
| | | Rhodeus Agass. } Fossil Genera in the lacustrine deposit | | | | | | | | | |
| | | Apius Agass. } of Cœningen. | | | | | | | | | |
| | | Perilampus McClell. | | — | — | 12 | — | — | — | — | 12 |
| | | Leuciscus Klem. | | 13? | 4? | 9 | — | — | — | — | 26 |
| | | Opsarius McClell. | | — | — | 12 | — | — | — | — | 12 |
| | | Pæcilia prop Schn. | | — | 4 | — | — | — | — | — | 4 |
| | | Lebias Cuv. | | — | 1 | 3 | — | — | — | — | 4 |
| | | Pæcilia McClell. | | 5? | 2 | — | — | — | — | — | 7 |
| | | Molnesia Leseur, | | — | 1 | — | — | — | — | — | 1 |
| | Cyprinodon Lacép. | | 2 | 4 | — | — | — | — | — | 6 | |
| | Aplocheilus McClell. | | — | 3 | — | — | — | — | — | 3 | |
| | APALOPTERI- NÆ McClell. | Anebleps Bl. | | — | — | — | — | — | 1 | — | 1 |
| | | Platy cara McClell. | | — | — | 3 | — | — | — | — | 3 |
| | | Psilorhynchus McClell. | | — | — | 2 | — | — | — | — | 2 |
| | | Cobitis } Cobitis propina McCl. | | 2 | — | 12 | — | — | — | — | 15 |
| | | Lin. } Schistura McClell. | | — | — | 11 | — | — | — | — | 11 |
| | | | | 42 | 37 | 139 | 4 | 2 | 4 | 1 229 | |

"The American species of this family referred to in the *Regnè Animal*, only amount to thirty-three, but Dr. Richardson in his report on North American Zoology mentions nearly as many more, imperfectly indicated by Rafinesque Smaltz, and other writers as belonging to the rivers and lakes of the new world;* still however the preponderance of species in favour of India is so remarkable, that it is only by extending our consideration to other genera of the order *Malacopterygii abdominales* that we find the equilibrium restored in the distribution of fresh-water fishes. Thus the *Salmonidæ* which form a large proportion of that order in the rivers of both Europe and America, are in India quite unknown, not one species of that extensive family having

"* I have not yet seen the volume of *Fauna Boreali Americana* by Dr. Richardson, which is devoted to Ichthyology, the volume on Birds being the only part of that important work which has reached India.

yet been found in this country, where the blank appears to be filled up by the excessive development of the *Cyprinidæ*.

"One species of Tench,* four Leuciscs,† and one Gudgeon,‡ are enumerated among the fossils of Ceningen by M. Agassiz, who also describes two new genera || *Rhodeus* and *Apius*, nearly allied to, but distinct from the *Perilamps* and *Systemos*. They are distinct from the first, by the dorsal and ventral margins being equally arched, and the caudal and anal fins being less developed; and from the second, by the absence of spines in either of the latter fins; both belong however to *Sarcoborinæ*, and will serve to render that group far more complete than it appeared to me to be before I saw M. Agassiz's splendid work. Two fossil species of *Cobitinæ* are also found in the same locality, one of these, *C. cephalotus* Agass. belongs to *Schistura*. The marlstone in which these remains are found is justly considered by M. Agassiz to be a lacustrine deposit, and supposed to be coeval with the molasse of Switzerland and the sand stone of Fontainebleau, and consequently to correspond with the miocene or early tertiary period." *Op. cit. p.* 257—262.

As a specimen of the manner in which the subject is treated we shall here give from the synopsis of his paper one of the three sub-families into which Mr. M' Clelland has separated the Cyprins; on a future occasion we may quote the two remaining sub-families, from the same part of the work. *p.* 264—283.

"1. SUB-FAM.—PÆONOMINÆ. § J. M.

"CHAR. Mouth slightly cleft, either horizontal or directed more or less downward. The stomach is a lengthened tube continuous with a long intestinal canal. Colours plain. Three rays in the branchial membrane.

"OBS. They occur only in fresh-water, and comprise a large proportion of the fishes of lakes and rivers, more especially those that are of economical importance. Their food consists chiefly of confervoid plants and other productions of the vegetable kingdom.

* *Tinca leptosoma*, Agass. *Recherches sur les Poissons Fossiles*, vol. v. t. 51.

† *Leuciscus papyraceus*, Agass. V. t. 36. *P. leptus*, Agass. V. t. 57. *L. pusillus*, id. l. c. *L. ceningensis*, id. and *L. heterurus*, id. l. c.

‡ *Gobio analis*, Agass. t. 57.

|| *Rhodeus elongatus*, Agass. t. 54. and *R. latior*, id. l. c. Of the genus *Apius*, M. Agassiz describes *A. gracilis*, and *A. brongiarti*, V. t. 55.; but the latter as well as *Leuciscus papyraceus* are from the lignites of Mènat.

§ From *Poionomos*, that feeds on herbs.

"I. GEN.—CIRRHINUS.

"CHAR. Lower jaw composed of two short limbs loosely attached together in front, where instead of a prominent apex, there is a depression; lips soft and fleshy with four cirri,* dorsal without spinous rays.

"OBS. This genus would seem to be represented in America by the *Catastomi* of Leseur, and in Europe by *Cyprinus proprius*, Cuv. In India it affords several of the most favourite, abundant, and wholesome species.

Spec. C. macronotus, J. M. t. 41. f. 1.

Length of the head to that of the body as one to four; forty-one scales along the lateral line, and thirteen in an oblique line from the base of the ventrals to the dorsum. D.23 : P.16 : V.9 : A.7 : C.19.

HAB. Assam and North-eastern parts of Bengal, where it attains from two to three feet in length.

Spec. C. nandina, Buch. P. G. † t. 8. f. 84.

Length of the head to that of the body as one to three; forty-four scales along the lateral line, and twelve in an oblique line from the base of the ventrals to the dorsum. D.26 : P.16 : V.9 : A.7 : C.19.

HAB. Bengal and Assam.

Spec. C. calbasu, Buch. P. G. t. 2. f. 33.

Length of the head to that of the body as one to four and a half; forty-two scales along the lateral line, and fourteen in an oblique line from the base of the ventrals to the dorsum. D.15 : P.17 : V.9, or 10 : A.8 : C. $\frac{10}{9}$.

Variet. Forty-two scales along the lateral line, and fifteen in an oblique line from the base of the ventrals to the dorsum. D.16 : P.15 : V.9 : A.5 : C. $\frac{9}{10}$.

HAB. Bengal and Assam.

Spec. C. rohita, Buch. P. G. t. 36 f. 85.

Length of the head to that of the body somewhat less than one to three; forty-two scales along the lateral line, and twelve in an oblique line from the base of the ventrals to the dorsum. D.15 : P.16 : V.9 : A.7 : C. $\frac{10}{9}$.

Variet ‡ t. 41. f. 2. Forty-three scales along the lateral line, and thirteen in an oblique row from the base of the ventrals to the dorsum. D.15 : P.16 : V.9 : A.8 : C.20.

HAB. Bengal and Assam.

* I am not sure as to cirri forming any very valuable character of a natural genus. The length of the dorsal fin certainly does not; in the first species it is as long as in the Carp.

† P. G. These initials refer to Buchanan's work on Gangetic Fishes.

‡ This fish attains a large size in Assam, and is probably the true *Ruee* of the natives. That which is figured by Buchanan is as far as I have seen a small fish, though the larger kind which I have figured would seem to be the one he has described. This as well as the preceding species present so many varieties, probably the result of artificial means resorted to for their propagation, from their value as an article of food, that it is difficult to define their true characters.

Spec. C. gonius, Buch. P. G. t. 4. f. 82.

Scales minute; snout muscular and perforated by numerous mucous pores. D.15 : P.17 : V.9 : A.7 : C.19.

HAB. Bengal and Assam.

Spec. C. nancar, Buch. P. G. p. 299.

Sub-operculum rudimentary, and concealed beneath the integuments D.20 : P.18 : V.9 : A.8 : C.19.

HAB. North-eastern parts of Bengal.

"The following three species have a black spot at the base of the caudal, and the dark colour of the back descends in fasciated points on the sides, thus indicating a relation with the *Sarcoborinæ*; but until the nature of this relation be determined, and their habits and structure known, I place them with the *Cirrhins*. I only know them by Buchanan's figures and descriptions.*

Spec. Cyp. morula, Buch. P. G. Pl. xviii, f. 91.

Length of the head equal to the altitude of the body, and to a fourth of the length; lips pendulous, the hinder fimbriated. D.13 P.16 V.9 A.8 C.19.

HAB. Ponds in Bengal.

Spec. Cyp. joalus, Buch. t. 42, f. 6. β †

Head large and very blunt, mouth low and horizontal. D.12 P.16 V.9 A.8 C.—

HAB. North-eastern parts of Bengal.

Spec. Cyp. dero, Buch. P. G. t. xxii, f. 78.

Only two cirri. Head oval and blunt, snout prominent and rough, lips smooth-edged. D.13 P.18 — V.9 A.7 C.19

HAB. Bramaputra

" SUB-GEN.—LABEO.

"CHAR. Structure and habits agree with those of the *Cirrhins*, but cirri are wanting, or very minute.

"OBS. The last species would seem to be a *Catastomus*, and the two first to be very nearly allied to each other, and to differ chiefly from *C. gonius*, Buch. in being without cirri. They correspond with the species named by Buchanan, *Cyp. curchius*, *C. cursa*, and *C. cursis*, but I cannot altogether reconcile them with his descriptions; they appear to me to be varieties resulting from domestication.

* To these may be added for the present *Cyp. pausio*, Buch. P. G. 317, t. 42 f. 4 β . It seems to differ from them merely in being without cirri.

† This sign β , denotes that the figure given is from Buchanan's collection.

Spec. Cyp. curchius, Buch. t. 40. f. 3.

Scales minute and disposed so as to indicate longitudinal stripes, lips fleshy and fimbriated, seventy-eight scales along the lateral line, and thirty from the base of the ventrals to the dorsum. D.17: P.16: V.9: A.7: C. $\frac{10}{9}$.

HAB. Bengal and Assam.

Spec. Cyp. cursis,* Buch. t. 38. f. 3.

Snout thick and projecting, eighty-three scales on the lateral line, and about twenty-seven across the body from the base of the ventrals to the dorsum. D.16: P.17: V.9: A.7: C. $\frac{10}{9}$.

HAB. Assam and Bengal.

Variet. Cyp. cursa, Buch. t. 38. f. 2. β

Scales and fin rays the same as in *C. curchius*, but the back is more abruptly arched, and the abdominal margin is straight to the anal.

Spec. C. dyocheilus,† J. M. t. 37. f. 1.

Goreah of the Assamese.

Head long, opercular plates covered with thick integuments, snout muscular, forty-four scales along the lateral line, and thirteen in an oblique line from the base of the ventrals to the dorsum. D.12. P.18: V.9: A.8: C.19.

HAB. Assam, where it usually attains two feet and upwards in length.

“II. GEN.—BARBUS.

“CHAR. Lower jaw composed of two lengthened limbs, united in front so as to form a smooth narrow apex. Dorsal short preceded by a strong spine, lips hard, four cirri, intermaxillaries protractile.

“OBS. Species of this genus inhabit the Caspian Sea, the Nile, and several of the rivers of Europe, generally confined to clear water. The comparative shortness of the intestinal canal proves them to be less exclusively herbivorous than any other fishes of the same sub-family. The Indian species, indicated in the *Regné Animal*, all belong to other genera.

Spec. B. hexastichus,‡ J. M. t. 39. t. 2.

Cyp. tor, Buch. P. G. 305.

Lobura of the Assamese.

Length of the head to that of the body as two to seven, twenty-five scales along the lateral line, and six in an oblique row from the base of the ventrals to the dorsum. D.11: P.17: V.9: A.8: C.19.

HAB. Great rivers in the plains of India. Ordinary length from one and a half to three feet.

* This variety had been figured from a dried specimen and transferred to stone, before I found in Buchanan's collection a most excellent drawing of it.

† So called from the pendulous structure of the snout descending so as to form the appearance of a second lip.

‡ From the scales forming six rows along the sides.

Spec. B. progeneus,* J. M. t. 56. f. 3.

Cyp. tor, Buch. Coll.

Length of the head to that of the body as one to three, twenty-six scales along the lateral line, and six in an oblique row from the base of the ventrals to the dorsum, with a large cellular appendage to the apex of the lower jaw. D.12 : P.16 : V.9 : A.7 : C.19.

HAB. Great rivers in the plains of India. Ordinary length from $1\frac{1}{2}$ to 3 feet.

Spec. B. macrocephalus, J. M. t. 55. f. 2.

Bura heta of the Assamese.

Length of the head to that of the body as two to five, twenty-seven scales along the lateral line, and six in an oblique line from the base of the ventrals to the dorsum. D.11 : P.16 : V.10 : A.7 : C.19.

HAB. Rapids in Upper Assam. Ordinary length from 2 to $3\frac{1}{2}$ feet.

Spec. B. hexagonolepis,† t. 41. f. 3.

Bokar of the Assamese.

Length of the head to that of the body as one to four, exposed surface of the scales hexagonal, twenty-seven scales along the lateral line, and seven in an oblique line from the base of the ventrals to the dorsum. D.12. P.16 V.9 A.7 : C. $\frac{10}{9}$.

HAB. Upper Assam. Ordinary length from $1\frac{1}{2}$ to $2\frac{1}{2}$ feet.

Variet. Cyp. putitora, Buch

Head small and blunt, with eleven rays in the dorsal, attaining occasionally nine feet in length.‡

Spec. B. megalepis,§ Hardw. Illust t. 93.

Cyp. mosal, Buch.

Mahaseer of the Hindus.

Body below uniformly arched at the insertion of the anal, length of the head to that of the body as one to three. D.13 : P.17 : V.9 : A.7 : C. $\frac{10}{9}$.

HAB. Northern parts of Bengal. Length occasionally four or five feet.

Spec. B. chelynoidea, J. M. t. 57. f. 5. Jour. A. S. vii. t. 56. f. 5.

Head large, lips thick and smooth, thirty-three scales along the lateral line, and nine in an oblique line from the base of the ventrals to the dorsum. D.10 : P.16 : V.9 : A.7 : C.18.

HAB. Mountain streams at Simla. Usual size about six inches in length. Dr. Macleod's Coll.

* From *Προγενειος*, that has a prominent chin or long beard; in allusion to the singular appendage to the lower jaw of this species by which it may be easily recognized.

† In allusion to the form of the exposed portion of the scales.

‡ This fish I have been unable to identify with Buchanan's description, I may therefore have described it under another name; he says the head is blunt, oval, small, and smooth, which scarcely applies to either of the foregoing, in which the head is remarkably lengthened; that of *B. hexagonolepis* would come nearest to it, though some of the others seem to correspond more in other respects with the account given. Pisc. Gang. 303.

§ From *Mega* large, and *lepis* a scale.

“OBS. The following five species have the dorsal spine serrated behind. The first three are probably varieties of the same species.

Spec. Cyp. sarana. Buch. P. G. p. 307.

Cyp. kanta, id Coll.

Cyp. kunamo Russ ?

Head blunt, oval, and small, with a small bone at either side of the upper lip, green above, below silvery, scales large. D.10 : P.16 : V.9 : A.8 : C.19.

HAB. Ponds and rivers in India. Rarely attaining two feet in length.

Spec. B. spilopholus,* J. M. t. 39. f. 4.

Head much compressed, cheeks and snout perforated with mucous pores, forty-eight scales along the lateral line, and seventeen in an oblique row from the base of the ventrals to the dorsum; each scale marked with a black spot at the base. D.11 : P.15 : V.9 : A.7 : C. $\frac{10}{5}$.

HAB. Northern parts of Bengal.

Variet. Cyp. chagunio, Buch. P. G.

Scales large and spotted at the base, head much compressed, with numerous prominent mucous pores on its fore part. D.12 : P.15 : V.10 : A.8 : C.19.

HAB. Northern parts of Bengal.

Spec. B. deliciosus, J. M. t. 39. f. 3.

Head short and blunt, thirty-four scales along the lateral line, eleven in an oblique line from the base of the ventrals to the dorsum, with a bright gold coloured spot on each operculum. D.12 : P.16 : V.9 : A.7 : C.19.

HAB. Assam. Ordinary size about 10 inches in length.

Spec. B. rododactylus,† J. M.

Fins red and orange, except the dorsal and upper lobe of the caudal, ten rays in the dorsal.

HAB. Lower Assam. Usual size about 5 inches in length.

“SUB-GEN.—OREINUS,‡ J. M.—MOUNTAIN BARBELS.

“CHAR. Head fleshy, mouth vertical, lower jaw shorter than the upper, snout muscular and projecting, furnished with cirri, dorsal preceded by a serrated spinous ray, scales small.

“OBS. Intestinal canal and stomach form a tube equal to about four or five lengths of the body, including the head and caudal.

* From *spilos* a spot, and *pholis* a scale.

† *Rododactylos*, literally rosy-fingered, in allusion to its red fins.

‡ From *Oreinos*, pertaining to mountains. This genus has been since published by M. Von Heckel a German naturalist, from the collections taken home to Europe by Baron Hugel on which Mr. McClelland observes page 455 “that it would really seem as if we intended to leave all that requires either intellect or observation to discover in the productions of India to our neighbours on the continent, &c. &c. To be fairly rivalled in any pursuits where facilities are equal between the parties would be bad enough, but to be indebted to strangers for a knowledge of the productions of our own country argues a fault somewhere, but where that fault lies it might be a delicate question to enquire, as none of us I fear, would be altogether free from a share of the reproach.”

Spec. O. guttatus, J. M. t. 39. f. 1.

Head covered with thick integuments, branchial apertures small, sides and fins irregularly marked with brown spots, scales minute. D.10: P. 17: V.11: A.10: C.20.

HAB. Mountain streams in Bontan, at an elevation of about 5000 feet, where it was found by Mr. Griffith.

Spec. Cyprinus Richardsoni, Gray. Hardw. Illust. t. 91. f. 2

About eleven rays in the dorsal, and nine in the anal, back speckled with minute dots.*

Spec. O. maculatus, J. M. t. 57. f. 6. Journ. A. S. vii. t. 56. f. 6.

Mouth situated on the lower surface of the head, small shapeless spots irregularly distributed over the body, but not on the fins, scales minute. D.11: P.18: V.10: A.5: C.19.

HAB. Mountain streams at Simla, elevated between 5000 and 6000 feet, where it was found by Dr. Macleod.

Spec. O. progastus,† J. M. t. 40. f. 4. Adoe of the Assamese.

Muzzle fleshy and pointed, lips thick, somewhat pendulous and muscular, abdomen very prominent beneath the pectorals. D.12: P.13: V. 10: A. 7: C.19.

HAB. Rapids in Upper Assam, where it occasionally attains 18 inches in length, but its flesh is believed to produce vertigo and other alarming effects on those who use it.

“ III. GEN.—CYPRINUS PROPRIUS.

“CHAR. Body elevated, lower jaw short and rounded in front, lips hard, thick, and without cirri; dorsal long. Dorsal and anal usually preceded by spinous rays.

“OBS. Only two species of this group have been as yet found in India, and one of these is without the dorsal and anal spinous rays.‡

Spec. C. semiplotus, J. M. t. 37. f. 2 Sentooree of the Assamese.

Head slightly depressed, with a single row of large mucous pores extending horizontally in front of the snout, back gibbous, thirty-two scales along the lateral line, and ten in an oblique row from the base of the ventrals to the dorsum. D.27: P.16: V.9: A.9: C.19.

HAB. The rapids of the Bramaputra in Upper Assam. Usual size 1 foot to 1½ in length.

* This may probably prove to be *O. guttatus*.

† Προγαστος, that has a prominent belly.

‡ They have little affinity to each other; in *C. semiplotus*, the head is small and fleshy, so as to conceal the opercular plates, and in *C. catla*, it is large with naked opercula.

Spec. C. catla, Buch. P. G. t. xiii. f. 81.

Head large, forty-four scales along the lateral line, and fourteen in an oblique row from the base of the ventrals to the dorsum. Dorsal and anal without spinous rays. D.18 : P.18 : V.9 : A.8 : C.19.

HAB. Fresh-water rivers and ponds in Bengal and Assam. Ordinary size from $1\frac{1}{2}$ to 3 feet in length, but occasionally it is found twice that size.

“IV. GEN.—GOBIO.

“CHAR. The dorsal is placed over the ventrals, and like the anal is short and without spines, lower jaw shorter than the upper, and is either round or square in front, lips thin and hard, snout prominent.

“OBS. The Gudgeons thus defined are a very natural group, remarkable for the extraordinary length of the abdominal canal. One of the only two indicated by Cuvier from Buchanan’s species, is an Opsarion, a genus no less remarkable for the shortness of the abdominal canal than the Gudgeons are for its length; but as the distinctions on which the subdivisions of the family are here made, have not before been observed, we cannot be surprised, that it should be repeated in the last edition of the *Regné Animal* from Linnæus, that the stomach of *Cyprinidæ* “is continuous with a short intestine.” The following five species have each two cirri.

Spec. Cyp. nrigata, Buch. t. 38. f. 1. P. G. t. 6. f. 7.

Length of the head to that of the body as one to four and a half, depth of the body about one-fourth of the length, forty-four scales along the lateral line, and fourteen in an oblique line from the base of the ventrals to the dorsum. D.16. P.17 : V.9 : A.8 : C.19.

HAB. Rivers and ponds throughout Bengal and Assam. Ordinary length two feet.

Variet. Rewah of the Natives, t. 58. f. 1.

Head less compressed than the body, upper jaw somewhat prominent, forty-three scales on the lateral line and thirteen in an oblique line from the base of the ventrals to the dorsum. D.15 : P.16 : V.9 : A.8 : C.19.

HAB. Ponds in the vicinity of Calcutta. Length from 6 to 12 inches.

Spec. Cyp. curmuca, Buch. Jour. Mys. III. t. 30.

Snout prominent and furnished with tubercles or mucous pores, lips smooth, and on each there is a small bone. D.11 : P.16 : V.9 : A.8 : C.18.

HAB. Rivers in Southern India, where it occasionally reaches three feet in length.

Spec. Cyp. reba, Buch. P. G. p. 280.

Head blunt, mouth small and directed downwards, lips soft. D.11 : P.17 : V.9 : A.8 : C.19.

HAB. Northern parts of Bengal and Behar, where it attains two feet in length.

Spec. Cyp. acra, Buch. P. G. p. 284.

Cyp. angra, id. Coll.

Cyp. Hamiltonii, Gray, Hardw. Illust. t. 86. f. 1

Lasseem of the Assamese.

Snout prominent and fleshy, thirty-five scales along the lateral line, and fourteen in an oblique line from the base of the ventrals to the dorsum.

D.10 : P.10 : V.9 : A.8 : C.19.*

HAB. Bramaputra.

Spec. G. lissorhynchus, † J. M. t. 55. f. 5.

Snout smooth and blunt without cirri, thirty-nine scales along the lateral line, and thirteen from the base of the ventrals to the dorsum. D.11 : P.16 : V.9 : A.8 : C.19.

HAB. Large Rivers of Bengal and Assam. Usual length 6 to 9 inches

“ In the six following species the scales are thin and rough, and generally placed so that each scale is in the axis of the one immediately preceding or succeeding, and not in regular oblique rows as is usual in the family ; but this peculiarity is not so well marked in some species as in others. They are all without cirri.

Spec. Cyp. bangon, Buch. Coll. t. 58 f. 2. β

Cyp. cura, id. P. G. p. 381.

Snout smooth without cirri, scales in parallel rows with a grey line between each row. D.12 : P.15 : V.9 : A.7 : C. $\frac{10}{9}$.

HAB. Bengal, where it attains a size of eight or ten inches.

Spec. Cyp. boga, Buch. P. G. t. 28. f. 80.

Snout perforated with numerous mucous pores, lower lip fimbriated, scales raised on either side of the base of the dorsal, lobes of the caudal slightly divided. D.12 : P.—V.9 : A.8 : C.—

HAB. Bramaputra. Usual length about nine inches.

Spec. G. bicolor, J. M. t. 40. f. 1.

Snout smooth, long, and rather pointed, lower jaw shorter than the upper, forty-two scales on the lateral line, thirteen in an oblique row from the base of the ventrals to the dorsum. Blue above, beneath silvery, pectorals small. D.12 : P.16 : V.9 : A.7 : C.19.

HAB. Rivers on the northern side of Assam. Griff. Coll.

Spec. G. anisurus, ‡ J. M. t. 40. f. 2.

Snout blunt, lower jaw shorter than the upper, lips hard and smooth, thirty-nine scales along the lateral line, and thirteen in an oblique row from the base of the ventrals to the dorsum, lower lobe of the caudal longer than the upper. D.12 : P.17 : V.9 : A.7 : C. $\frac{9}{10}$.

HAB. Upper Assam. Griff. Coll.

* Buchanan gives the fin rays as D.11 : P.18 or 19 : V.9 : A.8 : C.19.

† From *lissor* smooth, and *rhynchus* the snout.

‡ From *anisos* unequal, and *oura* a tail.

Variet. Cyp. bata, Buch. P. G. p. 383.

Upper lobe of the caudal longer than the lower, with an ill defined transverse bar, ventrals smaller than the pectorals. D.12: P.17: V.9: A.8: C.19.

HAB. Rivers and ponds in Bengal, where it attains a foot in length.

Spec. G. limnophilus,* J. M. t. 55. f. 3.

Scales in parallel rows, thirty-six in each row, and twelve across the body.

D.10: P.19: V.9: A.7: C.19.

HAB. Ponds in Bengal. Length 12½ inches.

“In the remaining species the scales are as usual in oblique rows.

Spec. Cyp. pangusia, Buch. t. 42. f.1. β†

Snout fleshy, porous, and prominent, forty-one scales along the lateral line, and fifteen across the body; lips fimbriated. D.14: P.18: V.9: A.7: C.19.

HAB. Bengal, where it attains a span in length.

Spec. Cyp. ariza, Buch. Jour. Mys. 111. t. 31.

Snout and under lip smooth, twelve rays in the dorsal; in other respects it resembles the last.

Spec. G. ricnorhynchus, J. M. t. 55. f. 1.

Snout thick and wrinkled, forty-three scales along the lateral line, and ten across the body from the base of the ventrals to the dorsum. D.12: P.17: V.9: A.7: C.19.

HAB. Northern parts of Bengal, here it was found by Mr. Hodgson.

Spec. G. malacostomus,‡ J. M.

C. falcata, Gray Hardw. Illust. t.—?§

Nepura of the Assamese.

Snout thick, fleshy, and perforated with numerous large mucous pores, margins of the lips double and fimbriated. D.12: P.16: V.9: A.8: C.19.

HAB. Rapids in Upper Assam. Length from six to twelve inches. Mr. Griffith's Coll.

“V. GEN —GONORHYNCHUS.

“CHAR. Mouth situated under the head, which is long and covered with thick integuments, body long and sub-cylindrical, snout perforated by numerous mucous pores, dorsal and anal short, opposite, and without spines. The intestine and stomach form a continuous tube about eight lengths of the body.

* From *Λιμνη* a swamp or lake, and *φιλος* to love or frequent.

† Its form is not so slender as represented in the figure. Buchanan also gives seventeen rays to each pectoral, and eight to the anal.

‡ From *μαλακος* soft, and *στομα* the mouth.

§ This plate is not numbered in Hardwicke's Illustrations, nor is it included in the list of plates prefixed to the volume.

"Obs. This genus hitherto rested on a single species long since found at the Cape of Good Hope, but the *Garra* of Buchanan chiefly belong to it, as well as several species which have since been found in India.

"The first three species are without cirri.

Spec. G. gobioides, J. M. t. 43. f. 1. *Heriwa* of the Assamese.

Altitude of the body to its length as one to four, thirty-seven scales along the lateral line, and nine in an oblique row from the base of the ventrals to the dorsum. D.10. P.15: V.9: A.7: C.19.

HAB. Bramaputra, in Assam. Length about a span.

Spec. G. petrophilus, J. M. Jour. Asiat. Soc. iv. t. 1.

Scales very minute, body and head long, eight rays in the dorsal.*

Spec. G. rupicolus, J. M. t. 43. f. 4, 5.

Snout thick and smooth, pectorals rounded;† fins short, and the membrane in which their rays are enclosed thick and opaque; thirty-five scales along the lateral line, and nine in an oblique row across the body. D.8: P.10: V.9: A.6: C.20.

HAB. Mishmee mountains. Length about two inches. Griffith's Coll.

Spec. G. bimaculatus, J. M.

Snout warty, porous, and divided by a fissure, without cirri; a black spot at the base of the caudal, lower lobe of the caudal longer than the upper, thirty-four scales along the lateral line and eight rows between the ventrals, and dorsum; pectorals and ventrals lanceolate. D.9 P.13. V.9. A.7. C. $\frac{9}{10}$.

HAB. River Lachh at the foot of the Mishmee mountains, where it was found by Mr. Griffith.‡

Spec. Cyp. lamta, Buch. t. 43. f. 2. β P. G. p. 343.

Cyp. godiyava, id. Coll.

Four very short cirri, pectorals and ventrals lanceolate, and a black spot on either side of the tail, snout thick and warty. D.10: P.13: V.9: A.7. C.19.

HAB. Northern parts of Bengal, where it attains $2\frac{1}{2}$ or three inches in length.

Spec. G. gotyla, Gray, Hardw. Illust. t. 88. f. 3.

Snout thick, and divided by a deep transverse fissure in which numerous large mucous pores are situated, a fleshy pendulous point at each corner of the mouth; four minute cirri.

HAB. Mountains of India.

* The habits of this species are fully described, but we want to know more of its specific characters.

† The form of the pectorals is not accurately represented in the figure.

‡ Also at the foot of the Nipal mountains, where Mr. Hodgson appears to have found a specimen now in the Asiatic Society's collection. In this, however, the lobes of the caudal are of equal length. It is so like the succeeding variety that I have thought it unnecessary to figure it separately.

Spec. G. fimbriatus, t. 43. f. 3. β

Cyp. sada, Buch. P. G.

Four cirri little shorter than the head, pectorals and ventrals falcate.

D.10: P.—? V.9: A.7.

HAB. Northern parts of Bengal, where it attains a few inches in length.

“The remaining three have each two small cirri.

Spec. G. macrosomus,* t. 43. f. 7. β

Cyp. latius, Buch P. G. p. 346.

Depth of the body to the entire as one to six, two cirri, scales small,

D.11: P.13: V 9: A. 7: C.20.

HAB. Northern parts of Bengal.

Spec. Cyp. gohama, Buch. P. G. p. 346. t. 43. f. 6. β

Cyp. dyangra, id. Coll.

Is shorter in proportion, and more arched above and below than the former, and has eight rays in the anal.

HAB. Northern parts of Bengal.

Spec. G. brachypterus, J. M.

Lower surface of the head flat with a cartilaginous zone behind the mouth like *G. rupiculus*,† a few irregular pores on the snout, thirty-six scales on the lateral line and seven rows across the body.

HAB. Mishmee mountains. Griff. Coll.”

[A coloured drawing of each species is given, together with a detailed account of whatever is known regarding it.]

ART. IV.—*Account of a Journey from Sumbulpûr to Mednipûr, through the Forests of Orissa.* By LIEUT. M. KITTOE.

(Concluded from page 606.)

I marched from Mednipûr about the middle of December of the past year, and proceeded by the regular dawk stages as far as Doodkhundi a small village beyond Ghooteah, distant thirty-six miles. From this place I left the road and proceeded to Gopibullubpûr, a town on the right bank of the Subunreeka river and about eight miles due south.

On first leaving Mednipûr the Cossai river is crossed (forded) and the high iron-stone formation (at the extremity of which the town stands) is quitted. The road (if it deserves such a name) passes over low land as far as the second dawk station called Chardeh, a little beyond this the iron-stone is again met with, and forms the southern limit of the level valley of the Cossai, which is throughout highly cultivated

* From *Μακρος* long, *σωμα* the body.

† It also agrees with that species in the form of its fins; the presence of two very minute cirri being my chief reason for separating them, I have not thought it necessary to give a figure.

and thickly populated; the chief cultivation appears to be rice, there is however some indigo, also sugar-cane.

From Chardeh to Ektale (the 5th stage) there is but very little clear and cultivated land, consequently much jungle; a little cultivation occurs near Bajannah (the 3rd stage) also near Purooliah (the 4th). The soil is much the same as that of Mednipúr, perhaps a little more sandy. Although there is so much dense jungle, there are evidences of the land having once been cultivated, and were it cleared I should think that the soil would prove rich and well adapted to the growth of cotton.

Ektale is a large village on the edge of the high iron-stone formation, here bordering what may be termed the valley of the Dolung river, and (like that of the Cossai) fertile and well cultivated. There are several large villages right and left of the road towards Ghooteah, which is on the high land to the opposite side of the valley, distant four miles from Ektale.

Messrs. MacDonald have an indigo factory near Ghooteah and much plant is grown on the high grounds in its vicinity.

There appears to be much low jungle to the northward of the road, and a considerable belt to the southward also, beyond this towards the valley of the Subunreeka in the Dholbhoom and Maunbhoom districts (commencing near Ghooteah) the country is open and well cultivated, I remarked some very fine gram and mustard, and should think that superior wheat, barley, and flax might be grown throughout this tract, likewise sugar-cane. The scenery is very beautiful, particularly towards the southern and western horizon, the Semulpal, Kussum, and Baumunghatti hills in Mohurbhunj add greatly to the beauty of the landscape, and when the broad bed of the Subunreeka is full in the rains, it must also contribute no small share of elegance to the picture.

I halted a couple of days near Gopibullubpúr, which is a very large village belonging to a Gosain; a little to the northward are several other villages close together, the principal of which is Nyabussaun, it gives name to a large purgunnah belonging to Mohurbhunj. The Raja has given it on a long lease to Messrs. MacIntosh, indigo planters, who have several factories on the Maunbhoom side of the river, one of which is opposite to Gopibullubpúr; their bungalow was burnt down the night previous to my arrival. The Mohurbhunj people appear dissatisfied with the arrangements above alluded to, they seem to be averse to the cultivation of indigo, thinking that it impoverishes the land.

I wished to have advanced to the hills where the pass over which the dawk travels, is situated, but so determined were the people to prevent me, that I was obliged to alter my course. I did not lose much by it as I was enabled to survey the country along the right bank of the river and its vicinity, which had never yet been done. This portion of the Subunreeka valley is very fertile, but, of no great extent inland; undulating ground, and beds of shingle, covered with dense jungle occur, forming a belt that divides it, from the valley of the Boorabalung river, which rising in the Semulpal hills, winds under those of Kussum and Bunkatí, then flowing in a southerly direction towards the Nílгур hills under Balasore, finally empties itself into the sea near Bullramgurhí.

There is little or no fine timber on the belt of high land above alluded to; I passed over it in two marches, and entered the Boorabalung valley, then continued in a north-westerly direction to Bunkatí, the principal village of the purgunnah of Ooperbaugh. I crossed the Boorabalung which is a very clear, rapid stream, about kneedeep, with very steep banks; its course is here very tortuous, there are many rapids; I re-crossed it before reaching Bunkatí near to which place, I halted a couple of days. There are falls over some talcose rocks about a mile below the village, the spot is held sacred. The water does not fall from any great height, but the strange appearance of the rocks and the wooded banks of the stream, which above the falls is still and deep, render the scene very beautiful. The singular appearance of the rocks (talcose) is occasioned by the strata being vertical or nearly so, they lean against a totally different formation, which appears to be basalt in different stages of decomposition.

I here observed a very simple, though ingenious, way of entrapping fish. In one part of the falls, in a narrow space between two rocks, there is a long slanting thatch fastened, from the lower end of which is a fine basket work frame, slanting at a wider angle than the former, and above it; the fish in attempting to leap, fall on to the thatch and slip down to the lower part of it, from whence they cannot escape. The crafty Brahmuns impose on the people by telling them that the presiding "Thacoor" or deity has the power thus to cause the fish to sacrifice themselves to him or her. The Brahmuns remove the fish early in the morning, and cook them in their "Bhog mundup" temple cook-house; the first dish is placed as an offering before the idol, for the consecration of the whole, which is eaten by the attendant priests, or distributed to their friends.

The village of Bunkatí is nearly deserted, as well as most others in

this fine purgunnah ; the farmers are of the Bhoomia cast ; they have been obliged to forsake the lands on account of the serious extortions and acts of injustice inflicted on them by their dissipated and ignorant chief, the Raja of Mohurbhunj. It is much to be regretted that our Government has not the right to exercise more extensive control over the tributary mehauls in general, particularly over this of Mohurbhunj, in which there is so much fine land, that could be brought to favorable account. The ryots cultivate little more than what is sufficient to answer their immediate wants, knowing too well that the production and possession of more, would only afford further grounds and opportunities for their being plundered of all, it is hence that on the occurrence of a bad harvest the poorer people perish from starvation, and its accompaniment, pestilence. I have been told that more than half of the population of all the jungle mehauls has been swept away within the last three or four years from these causes ; judging from the scanty population, and the number of deserted huts to be seen in every village, wherever I have travelled, I am inclined to think that there is little exaggeration in the assertion.

It is scarcely necessary for me to add that it would be hazardous for Europeans to take tracts of country, (were the chiefs to give the lease of them) unless the government would protect their rights. There is an Indigo factory at Jaldá near Seersa in the Oopurbaugh purgunnah ; but as an instance of the uncertainty of procuring labourers, this factory was nearly at a stand still, during the present season, in consequence of the causes above alluded to, (viz. the desertion of the ryots.)

Whilst touching on the subject of Europeans farming in these mehauls, I must add that although the population is at present so scanty and at all times its number uncertain, I feel confident that were purgunnahs taken on long leases with the guarantee of protection on the part of our government there would be (under proper and equitable management on that of the European farmers) no want of ryots of all classes, Boomiahs or Sontauls, and even Dangurs from the northward, who would flock to them for employment ; the wants of these people are few, consequently labour is, and would be, very cheap. The Boomiahs are a powerful and industrious race of people, they are the principal landholders in these parts. The Sontauls are an inferior class, but a cheerful race and make very good labourers ; I have frequently seen eight or ten employed on the road, cheerfully dragging timber carts, with one or two of them playing on a kind of flute, made of the joint of a bamboo, as an accompaniment to the songs of the rest of the party.

There are a few *gullas* located here and there, they generally clan together and have villages to themselves. It would be of great service if some colonies of these useful people (who are usually bearers) were induced to come from the Mogulbundí* near Buddruc and Cuttack, and to establish themselves in different parts of the road, the only obstacle to dawk travelling would then be removed. I should here observe that the only sure means of establishing a good thoroughfare for both merchants and the dawk, would be for government to purchase the land on each side of the road, to the extent of half a mile each way or more, and then to allot it to the dawk runners and bearers, as well as to other persons requiring it; in a very few years every available beegah of ground would be eagerly taken, cleared and cultivated; for the first five years nothing but a nominal rent should be exacted, and ultimately it could be assessed at a low rate. The purchase would not amount to much, and some of the tracts I should think would be readily rented by Europeans, to wit the Bissai valley, which I shall presently describe.

From Bunkatí I proceeded due north for two short marches, when I reached the foot of the pass called "Nittai Maungur," or the "Thacooraní" ghat, from the high hill of that name, which commands it; this hill (as the name implies) is looked upon as a form of the goddess of destruction; all very prominent mountain peaks, caverns and natural curiosities in general, are deified by the benighted inhabitants of the jungles.

In the evening, I ascended the ghat, it is very rugged and steep, we lighted numerous bonfires to scare the wild beasts, and encamped for the night, in the middle of the road, the only level and clear ground we could find; the following morning we marched to Bissai, passing the Kurrumbilla dawk stage, about midway; it was here and on this occasion where I observed a break in the hills to the northward of the pass, that led to the discovery of a defile by which this valley can be entered with a scarcely perceptible ascent, I further discovered that a fine road existed, by which many years ago merchants used to travel, it is now blocked up with fallen trees, and overgrown with high grass, there are several tanks and many mango topes, one of the former is called the Brinjarah's tank. Judging from the vast number of large *peepul* and *banyan* trees of great size and age that occur by the road side, together with what information I was able to collect, I think that the road must be of great antiquity, and no doubt much frequent-

* The Mogulbundí includes most of the Purgunnahs in the plains which are under our regulations.

ed, the sites of many villages still appear. The people say that some of the former rebel zemindars of Baumunghattí blocked up this road, to compel the merchants to travel by the lower valley and through the town of that name; whatever truth there may be in this, it is equally probable that the thoroughfare was closed to keep out the Marhatta plunderers towards the end of the last century. I have traced this high road as far as the Byeturní and I have no doubt that it continued on to Sumbulpúr and thence to the western coast.

I halted for the day at the village of Bissai, this place, was together with every other in the valley, destroyed by the Coles in 1834-35, it has been partly rebuilt; before its destruction it extended for near a mile in length, but like most towns in Orissa, it had no depth. I continued my march and survey up the valley by the regular dawk stages and halted for a day at Nowagaon, which place I have before mentioned. Many small villages had sprung up since my visit on my march from Sumbulpúr, but every one had suffered more or less from the herd of wild elephants, sixty in number, which infest this valley and the surrounding country; these beasts had thrown down the huts to obtain the small stores of grain, and had destroyed every description of cultivation from one end of the valley to the other. Many people had put bags of poisoned rice in their stores but the sagacious beasts were not to be caught. I was told that since a number were destroyed by a Gosain many years ago, by poison, not one has taken the bait.

Nowagaon is (as I have said before) within a couple of miles of the westernmost extremity of the valley; it has once been a large town and on the old road, the course of which is apparent from the rows of aged peepul, banyan, jaumun, mango, and other trees, there is a place near this, village held sacred, it consists of the remains of a temple under a clump of enormous trees of various kinds; to the branches of one of them, are nailed numerous pieces of iron chains of various sizes, which must have been fixed there as offerings to the destructive deity, whom the poor inhabitants suppose to live in a cavern at the top of one of the high hills which tower above the valley on its north side, close to the village; they believe that at night, she comes from her retreat and with the chains fastens up her herd of tigresses for the purpose of milking them. They further relate that whenever the villagers neglect to make the usual offerings of milk, rice, and fowls, she becomes enraged and loosens some of her tigers, who never fail to carry off both men and cattle. The poor zemindar could not understand why I did not make some offering, I could not speak Ooreyah, therefore I was unable to explain the folly of such degrading superstition.

The Bissai valley is evidently a most fertile tract of country, it is about twenty miles or more in length, and averages on the whole about four in breadth; there are several small streams intersecting it, and one large torrent called "Korkaie" which rises in the Seemulpal mountains to the southward, and crossing the valley between Nowagaon and Arjunbilla, winds down its northern face, turns round the base of the Soolapát hill (one of the points in the trigonometrical survey) then passing through the Baumunghattí valley continuing in a north easterly direction, ultimately joins the Subunreeka somewhere near Ghatislla; the water of this rivulet could be made available for sugar mills.

Leaving Nowagaon I proceeded by a narrow defile towards Jushpurgurh, which place I reached in two marches. I passed the Tinderí ghat (which I have already described) to my right, and found myself in another extensive valley, bounded on one side by the Buddaum range, and on the other by the lofty Seemulpal and Selma mountains. The villages here (like those of Bissai) have all been destroyed, the country has become a perfect wilderness but in the immediate vicinity of Jushpur it is open and well inhabited, the cultivation is chiefly rice and oil seeds.

Jushpurgurh is the capital of a large purgunnah of that name, belonging to Mohurbhunj, it is situated at the confluence of the rivulets Krère and Bundun, on a high mound between the two; the place was in former years strongly stockaded, but at present there is scarcely a vestige of the works left. The town is built round the foot of the mound.

The two rivers assume the name of Krèrebundun below their junction, where, for the distance of a mile they flow in a deep and narrow channel as far as a spot called Ram Teerut; at this place the (gneiss?) rocks stretch across a little below the level of the banks, the Krèrebundun falls over them into a tolerably deep chasm, in which there is a large circular basin; beyond it is a smaller fall into a second pool from whence the river flows over a gravelly bed by a most tortuous course, till it finally empties itself into the Byeturní a little above Jotepúr. The water is considered very good, there are fish in abundance, a very fine Mahasír was caught and brought to me. The mode of fishing here is curious, a net is let down and placed in a circular manner, several persons ply about in canoes and keep tapping the rocks at the bottom with long poles to frighten the fish from under them, the two ends of the net are gradually closed, it is then drawn up and the fish taken out.

There are the remains of a small temple beside the falls, also several strange marks in the rock caused originally by the water: some are

in the shape of a man's foot, others of the hoof of a cow, all have been improved by human skill, and the priests assert that the former are the marks of Ram and Seeta's feet; and the latter those of "Nandi" the bull of Siva.

In examining the nature of the rock and of the shingle bed, I discovered beautiful specimens both of the common and of the precious green serpentine, the natives say it is washed from a small hill above Jushpúr, it is a most beautiful mineral and would make very elegant mantel-piece ornaments; I sent a man to bring me a large quantity, but he never returned.

From Jushpúr I marched through an interminable forest for four days, being misled by the roguery of the zemindar, and the obstinacy of my guard and other attendants. I passed the site of many large villages, and over vast tracts of grass, elephant-high, growing on land where once luxuriant crops had smiled, but all is now a wilderness.

The forest has no underwood, every inch of the land could be cultivated. I left this wilderness, at Sukroorí a large Sassun village near the high road, and which I have mentioned in a former page, it belongs to a junior branch of the Mohurbhunj family styled "Burkonwur," who hold the purgunnah of their kinsman the Mohurbhunj Raja.

We had the misfortune of being overtaken by rain (which set in on the 12th January,) the first march from Jushpúr. We had great difficulty in procuring supplies, and were much tormented by the chicanery of the Zemindars, who were evidently acting under the Raja's orders; the rain fell daily, not a dry spot could be found, consequently every person suffered more or less, sooner or later; we were more fortunate at Sukroorí where there was good ground and plenty of shelter. The natives of the country seemed to take it very coolly, they always construct bowers under shady trees in the centre of which they set fire to huge logs of dry or rotten wood, which are kept constantly burning; at night, all hands sleep in a circle round the fire with their feet towards it, few have any clothing beyond a small piece of cloth, which answers at once the purpose of a dhotí, a covering sheet, and a bag to tie up their store of rice. I am inclined to think that there is a virtue in the dense smoke which is kept up, that it dispels malaria.

We halted three days at Sukroorí, but the rain not clearing, I deemed it expedient to order a move and marched to Gobindpur, the place where I had encountered the fearful tornado on my march from Sumbulpúr, thinking it better for my followers at any rate, to have the advantage of the good water of the Byeturní, I was however mistaken, the incessant rain caused almost every person in camp to catch

jungle fever; for several days I had barely a servant to attend upon me, I was forced even to pitch my own tent, I soon followed the general example likewise my family, for our tents were saturated as well as the ground, which being soft caused the pole to sink into it; not a dry spot was to be found. I broke ground and moved to Phoolkonlaie, where the soil was better, but the fever was too much rooted in all, for the change to be of any benefit; after passing many days in this unhappy state, I resolved on retreating the best way we could to Mednipúr, which station we fortunately reached on the sixth day; this change restored us.

A few remarks on the climate of these tracts, and the apparent causes of sickness may be acceptable.

While at Phoolkonlaie stretched on my back with fever, I observed that the wind below was blowing in a different direction from what it was above, which latter was westerly with a clear sky, we were enveloped in clouds and mist, with variable wind from an easterly direction; this atmosphere, if I may so term it, appeared to extend to the height of the level of the mountain tops, viz. about 1600 feet. The tract of land extending between the Buddaum and Keunjur hills, a span of 50 miles, is considered very unhealthy by all, may it not then be attributed to the absence of free and variable currents which in other more open tracts dispel the earth's vapors and prevent an accumulation, which must be the real cause of sickness? as long as the ground is dry there is less danger, but a single heavy shower followed by cloudy weather causes the poisonous vapor to rise, and there is no escaping its evil effects.

I have here described one cause of fever, but there is another of an opposite nature, viz. the intense heat of the country in the months of May and June, after every particle of vegetation has been consumed by fire. From the description I have heard of this fever I should imagine it to be of the brain; the patient with little warning is seized with a shivering, violent head-ache, and vomiting, delirium quickly follows, and in three days death puts an end to his miseries; natives and Europeans suffer alike from this scourge, for a more particular account of it, I would beg to refer my readers to Mr. Motte's *Journey to the Diamond mines*, alluded to in a former page.

Before I take leave of my readers, I will offer a few remarks on the products of the forests; of these the tussur silk is the most common, and at the same time, most valuable. Lac is also to be found; the production of both in large quantities might be effected, particularly of the former.

The tussur worm is reared on the *assena* trees (*Terminalia alata tomentosa*) which are left standing wherever the jungle is cleared and their branches are kept lopped to a certain height, the more easily to allow of collecting the cocoons, great quantities of which are also found in the forests; they are mostly bartered to the merchants from the plains, but some are spun and wove into coarse pieces for the wealthier ryots and zemindars of the country.

The lac insect is said to abound in the Nursinghur district, north of Dholbhoom, it has lately been imported and propagated in that purgunnah. It thrives on the *peepul* "*Ficus religiosa*" also on the *kussum*.

Those people who collect lac and attend to its culture, have certain superstitious rules, which they strictly adhere to, thinking that the slightest neglect will displease the patron deity and cause failure. They believe that there are certain quarters of the moon, and certain days, on which the insects taken from the parent stock must be spread on the trees, the persons who perform this office abstain from food or drink, neither do they wash nor perform any of nature's functions, there are other minor rules which I cannot recall to memory.

Dhoona (the resin of the *sál* tree) is collected in considerable quantities, and likewise bartered.

I believe that very few deer hides and horns are collected in these parts of Orissa, although there is no scarcity of ruminants of various species, amongst which are the formidable Gowrí Gaw (*Bos gaurus*.)

The forest abounds in fine timber, but unfortunately the largest and soundest trees are usually found in the most inaccessible glens. The *Tendoo* or bastard ebony grows to a great size and is very common; some trees produce very fine logs, and of any length, large quantities of this wood rough wrought in thin bars of from two to three feet in length, are exported to Mednipur where they are sold to the turners and converted into rulers, walking clubs, and hooka pipes, and ultimately sent to Calcutta.

There are many kinds of wood which I have no doubt would answer well for furniture purposes, that of the *nux-vomica* in particular, as no insect will go near it, not even the white ant, it is hard with rather a fine grain and pretty colour; the tree grows to a great height and size.

A small quantity of "*Kuth*" (*catechu*) is prepared from the *Krère* "*mimosa catechu*" but not for exportation.

The *pullas* (*Butea Fundosa*)[†] grow in the Keunjur jungles in greater numbers than in those of Mohurbhunj, and if there were a sale for the gum, no doubt the people would collect it.

There are many trees the seeds or nuts of which yield good oil, the *mohna* or *mowl* (*Bassia latifolia*) in particular is very plentiful.

Having enumerated all the jungle products which came under my notice, I must now add that for Europeans to traffic in any, it would be advisable to establish a mart at Kumererha on the Subunreeka, a large village through which the road passes, it is in the Dholbhoom purgunnah belonging to the Raja of Ghatsilla, it is nearly opposite to Seersa in Mohurbhunj, where there has long been a weekly mart held on Tuesdays; this would soon give way to any new one established on the Dholbhoom side, as property is more secure. There is an indigo factory near the village, belonging to Messrs. Macdonald, the situation is far from unhealthy for there is no heavy jungle very near the place, it is under the influence of the sea breeze which blows up the valley of the river. The hot weather is also rendered less oppressive from the frequency of severe thunder storms, which are attracted by the adjacent hills, they are generally accompanied with showers of rain and hail. The country as I have before said, appears very fertile particularly the lands of Dholbhoom, very good sugar is produced, and I should think that the Mauritius cane would thrive on some of the gravelly jungle tracts, the soil of which remains moist a few inches below the surface. The white ants would be the greatest drawback. I must now conclude, trusting that ere long, British industry and capital will be profitably employed in the jungle mchauls to the benefit of the merchant and of the now unhappy ryots upon whom the light of civilization has not yet dawned. M. K.

ART. V.—*Note on a pillar found in the Ganges near Pubna, and of another at Kurra near Allahabad.*—By Lieut. M. KITTOE.

The elegant pillar represented in the accompanying plate, Fig. 1. (together with three others) was found a few months back in a chur, (sand bank), in the Ganges near Pubna, and sent to the Asiatic Society, by Mr. Allen of the Civil Service. I requested that gentleman to give me any information he might be able to obtain, to enable me to judge, whether these elegant pieces of Hindú sculpture had been sunk there by accident, or whether they might not have formed part of some temple existing on the spot, previous to the River having taken its present course; the following is the reply he has favoured me with—

“It was found with three others exactly of a similar kind (one of which has been slightly injured), embedded in a chur on the Ganges

about four miles from this station (Pubna); the end of one of the pillars was visible on the sand bank, and all the four were dug up very close to one another, with them were found half a dozen stones, which were not sculptured, nor of any particular size; the latter seem to me to have been a part of the pavement or steps of the building."

Mr. Allen further states "on referring to Rennel's old Maps, I observe that at that time in the direction that the chur now is, there must have been a village at some distance from the river, traces of the ancient course of the Ganges are still visible about two miles and a half or more off."

On first examining the pillar it occurred to me that it had never been erected, as the capital is unfinished, and that in all probability it had been sunk by accident at a remote period, while being conveyed to some place lower down the river. I am now inclined to think that the whole may have belonged to some temple existing on the spot previous to the inroad of the river.

The pillar which is here represented is of a hard black stone, resembling basalt, but from the long action of the water and mud, its surface has become of a dirty white colour. Its height is seven feet in all, thirteen inches and a half at its base, (which is square) and ten inches and a half diameter at its summit which is circular; from the base to the second moulding, (three parts of its entire height) it has twelve sides; an exception to the more general rule, which requires the base to be square, the second division octagonal, the third of sixteen sides, and the fourth perfectly circular.

The style of architecture is that of the twelfth or thirteenth century. The workmanship is remarkably good, and the group of figures representing dancers and musicians though rather rudely proportioned, have much life in them. On one of the sides is a lizard, and on another a bee of which I cannot make out the meaning, unless they be merely as guide marks to the mason for facing them properly.

The circumstance of four only being found, confirms my opinion that they have supported the roof of the "Nandi Subha" or ante-room in which the "Nandi" (bull of Siva) is placed, and as the tops of the pillars are only rough hewn, it is probable that they supported a wooden roof such as are still common in the vicinity of Cuttack, where there are some of great antiquity and of most extravagant workmanship.

Fig. 2, represents the fragment of an elegant pillar at Kurra near Allahabad, which I drew several years ago, when encamped at that place. It is built into an old Mahomedan tomb of great antiquity, and

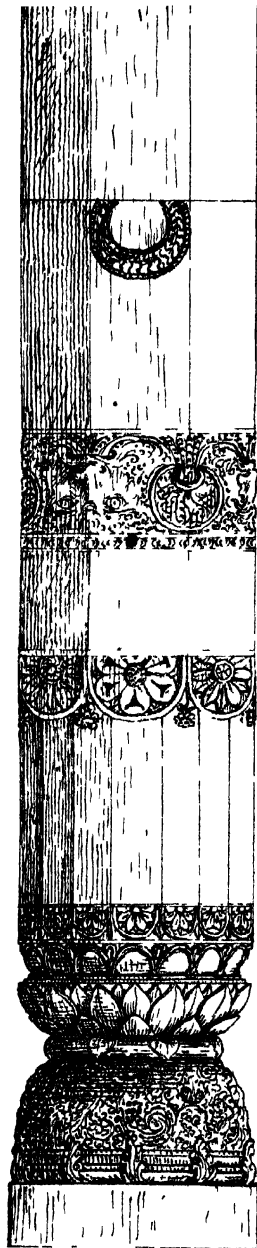


Fig. 2

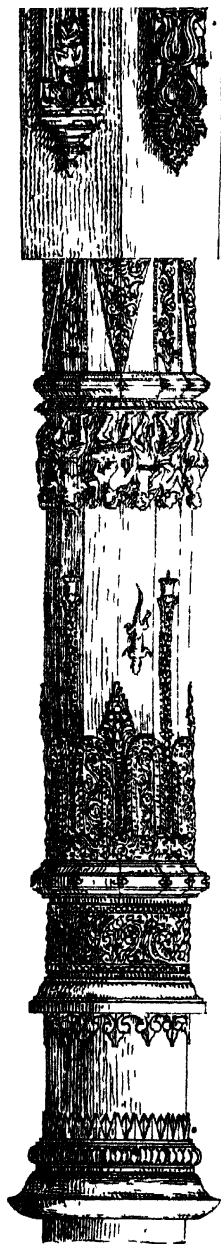


Fig. 1

has evidently been taken from one of the temples destroyed during the first Mahomedan invasion.

The most remarkable features are the heads, and festoons (hanging from their mouths), which is one of many instances I have seen of Hindú ornaments, apparently of Grecian origin, which I shall remark upon more particularly at some future period. M. K.

ART. VI.—*Note by Messrs. Jessop & Co. of Calcutta, on the smelting of the Iron Ore of the district of Burdwan.*

To the Officiating Secretary Asiatic Society.

DEAR SIR,—The Iron Ore with which we made the experiment in smelting, was a portion of that obtained by the Coal and Iron Committee from the district of Burdwan. We smelted above half a ton of it, which yielded about 2 cwt. of Iron, or barely 20 per cent.; it would therefore be considered an Ore of little value by the Iron masters in Great Britain.

The operation was carried on exactly according to the practice of the large blast furnaces in England;—owing however to some peculiarity in the nature of the metal it could not be brought into a fluid state, but after its reduction from the Ore, lay in a mass at the bottom of the furnace.

We were not prepared for such a result, and as we had no means of extracting the metal, we were compelled to discontinue the experiment, when the *hearth* had become full, instead of carrying it on for a day or two, or until the whole of the Ore we had at our disposal was consumed.

We have no doubt that if we could have submitted the Iron, as it lay in the furnace to the process of *puddling*, it would have been converted into an excellent malleable Iron, similar to that made by the natives in various parts of India, by whom the metal is never brought into a fluid state.—It would be interesting to ascertain whether the same difficulty, viz. the non-fluidity of the metal, was not experienced at the Porto Novo works; we have some reason to think that it was the case.

We consider it very probable, however, that after repeated experiments, conducted by persons experienced in the business, a method of treating the Ore might be discovered, by which the Iron would be obtained in a fluid state, so as to be available for the purposes of a foundry.

We have the pleasure to send you samples of the Ore before and after calcination, also of the Iron produced, and of the Lime-stone used in the experiment.—The latter was procured by us from Sylhet and is of excellent quality.

We are, Sir, &c. &c.

20th Sept. 1839.

JESSOP & CO.

P. S.—The following are the quantities of the materials expended ;—Ore 1220 lbs. Coke 1278 lbs. Lime-stone 744 lbs.—The experiment occupied about twenty-three hours.

ART. VII.—*Note on the habits of the Coel, and on the discovery of Isinglass.*—By MAJOR DAVIDSON.

To the Secretary to the Asiatic Society.

SIR,—Happening to stand in the veranda of my bungalow, a few days ago, I heard a loud chattering noise on the lawn ; believing that a young crow had fallen from its nest I advanced to put it out of the reach of harm. Instead of a crow I was much astonished to find that an old crow was feeding a young bird of a dark brown colour, transversely striped with cinereous bars. On asking its name of a native who also saw it, he replied that it was a young Coel. I approached it within a few yards and saw it receive food from the crow's bill, in the usual supplicating posture, with extended wings, and body slightly quivering. The native informed me that the Coel never made a nest, but always took possession of that of a crow, by whose incubation, its eggs were hatched ; and also, that the crow invariably continued to feed its adopted nestling, until it could shift for itself. From having seen this I can have no doubt of its truth. A few days ago the neighbouring mango topes, resounded with the plaintive notes of the Coel, but at present they are not to be heard from which I am inclined to believe, that like the Cuckoo it is a bird of passage. It is a curious coincidence that they should both rear their young by practising a similar imposition on other birds. Is this common to the genus ?

Observing in your 87th number that Mr. McClelland states, that "The very valuable production, *Isinglass*, has been recently found "to be yielded by one of the fishes of the Hoogly."

I beg to mention that on the 18th of June, 1820, while residing at Sooltanpoor, Oude, in a bungalow on the banks of the Goomty, I addressed a letter to that eminent naturalist the late Major General Hardwicke, acquainting him that I was in the habit of opening every

large fish of the genus *Cyprinus* that was brought for sale, and extracting the air bladder, from which I made Isinglass. While residing at Calpee, on the Jumna, in 1832, I made a quantity large enough to fill the drawer of a writing desk, from every large fish such as *Rohoo*, *Kulla*, *Muhaseer*, and various others which were brought for sale. The weights of the pods varied according to the size of the fish, (which was never above forty pounds) from half a drachm to half an ounce. I rejected the fibrous and soaked the gelatinous coat in strong limewater for five or six days, (in the *cold* weather) when it was ready for use as Isinglass, and equal to any for sale. I am of opinion that the article may be found in every fish that rises to breathe, whether whale, grampus, porpoise, shark, &c.; that the quantity will depend on the size of the fish, and the quality be found nearly similar in all.

I am Sir, &c. &c.

S. C. DAVIDSON.

Allahabad, 15th Sept., 1839.

ART. VIII.—*Note on the Scapes of Xanthorrhæa and Fossil Stems of Lepidodendra.*—By Lieut. N. VICARY.

To the Secretary to the Asiatic Society.

I have the pleasure to send you some remarks on the resemblance, existing between the stems of "*Xanthorrhæa*;" a native of New South Wales, and the fossil stems of "*Lepidodendra*." It is an object of such great interest to trace any affinity between fossils and existing species, that I make no apology for obtruding my rough note upon you, and asking you to publish it.

Xanthorrhæa belongs to the tribe *Asphodeleæ* and is well known in N. S. Wales under the name of "*Grass Tree*," the naked flower scapes rise to ten or twelve feet in height, from the bosom of a tuft of grass like leaves, and are used by the Aborigines as shafts for their spears, for which they are well suited from their lightness and strength; there are seven species described, some of which do not form a distinct stem, and others form a stem often eight or ten feet in height, and occasionally branched in an irregular manner, not symmetrical as in *Coniferæ*, from which in the fossil state, that alone would be sufficient to distinguish them—they have no true bark, but as in *Cycadææ* an outer coat formed by the bases of the fallen leaves, the coat is from one to two inches in thickness, rough outside, but becoming smoother on the older parts, exhibiting the bases of the leaves, arranged in quin-

cuncial order, their very bases become accreted within into a false bark of considerable strength—the outer coat is with difficulty separated from the fresh stem for the purpose of examination, but in the old and partly decayed stems, is easily detached and gives a clear view of the inner surface. I found some stems quite hollow, the woody core having decayed and disappeared, the cortical portion contains a large quantity of resin with the appearance and colour of Gamboge, which is perhaps the cause of its preservation, this resin is also found abundantly on the ground round the base of the plants, and I believe is for the most part exuded on those occasions when the grass is set fire to, a practice resorted to in N. S. Wales as in India, for the purpose of destroying the more rank kinds of vegetation—the inner surface of the false bark is densely covered with lozenge-shaped areolæ arranged in a quincuncial manner—the transverse diameter (with respect to the axis) is the longest—the woody core exhibits impressions of similar areolæ, a point rises in the middle of each, which is received in a corresponding hollow in the areola of the outer coat—it appears in fact as if the outer coat was a mould in which the wood was cast. the base next the crown of the root is thickest, rounded and blunt, the shaft is often irregular in thickness with a strangulated appearance, owing perhaps to those seasons in which the growth of the plant was retarded. I regret having neglected to examine a transverse section of the wood, and cannot recollect any thing peculiar about it unless its coarse and loose grain.

The above imperfect note exhibits several points that quadrate with the descriptions given of some *Lepidodendra* and I send it to you chiefly for the purpose of drawing the attention of those who feel an interest in such things to a further and more complete investigation of the subject. It was my intention to have brought some stems to Calcutta and to have followed up the inquiry with the assistance of some person more competent to the task, I however was unable to do so. It would be easy to procure them from Sydney, as there are many very large trees flourishing at about two miles to the South of it, small ones are to be had everywhere.—The resin mentioned above has been sent to England, and found to be useful to coach makers as a varnish.

I am Sir, &c. &c.

N. VICARY, 4th Regt. N. I.

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ART. IX.—*Proceedings of the Asiatic Society.*

(*Wednesday Evening, the 2nd October, 1839.*)

The Right Rev. the LORD BISHOP of Calcutta, Vice-President, in the chair.

The Proceedings of the last Meeting were read and confirmed.

Captain J. W. BIRCH was proposed by Dr. O'SHAUGHNESSY, seconded by the chairman.

Mr. E. K. HUME was proposed by Mr. STOCQUELER, seconded by the officiating Secretary.

Read a letter from the Secretary of the Royal Institution of Great Britain, acknowledging the receipt of copies of the Journal of the Asiatic Society.

Read a letter from Messrs. W. H. ALLEN and Co., Book Agents of the Society in London, forwarding account sales of the Transactions and Oriental publications, together with a statement of books supplied by them to the Society, exhibiting a balance of 16*l.* 12*s.* 2*d.* in their favor.

Library.

Read a letter from J. VAUGHAN, Esq. Librarian, American Philosophical Society, forwarding the following books for presentation to the Society :—

Transactions of the American Philosophical Society, vol. 6th, part 2nd, New Series

Memoir of Dr. P. S. PHYSICK, by J. RANDOLPH, 1 vol.

Proceedings of the American Philosophical Society, Nos. 3, 4, 5, and 6.

Medical Statistics from 1821 to 1830, by G. EMERON, Esq.

Read a letter from Mr. J. AYDALL, forwarding for presentation a copy of an Armenian and French Grammar.

Read a letter from H. T. PRINSEP, Esq. Secretary to the Government of India, forwarding 50 copies of the Rev. W. TAYLOR's examination and analysis of Colonel MACKENZIE's Manuscripts.

The following Books were presented —

Bulletin de la Société Géographique, vol. 10—*by the Society.*

Proceedings of the Geological Society, Nos. 60 and 61, with a list of its Members—*by the Society.*

Proceedings of the Committee of Commerce and Agriculture of the Royal Asiatic Society—*by the Society.*

Transactions of the Society of Arts, &c. vol 52, part 1st.—*by the Society*

Crisp's observations on the abolition of the Impress System in two letters, addressed to J. W. COOPER, Esq.—*by the Author.*

Ditto, Treatise on Marine Architecture.

Notice Historique sur la vie et les Voyages de René Caillie, par M. Jomard, Paris, 1839.

L'Inde Française ou collection de dessins Lithographiés, représentant les Divinités, &c. &c. des peuples Hindoues qui habitent les possessions Françaises de l'Inde, et en général la Cote de Coromandel et de Malabar, par M. J. J. Chabrelié, avec un texte explicatif, par E. Burnouf et E. Jacquet Paris, 1827 et 1835. Tome 1st and 2nd, folio, 2 copies—*from the Government of India.*

Recherches sur les Ossements Fossiles, par G. Cuvier, 4th edition Paris, 1834 à 1837, 8vo.

Atlas. a ditto ditto, en Livraisons.

Le Règne Animal distribué d'après son Organisation, par G. Cuvier, Paris, 1835, Liv. 49 Molusques, 10mo. Liv.

Compendium Logicæ—presented by the Bishop of Isauropolis.

The following books were received from the Booksellers:—

Royle's *Illustrations of Botany*, part 10th.

Lardner's *Cabinet Cyclopædia*; *History of England*.

Alif Leila, 5 copies—subscribed for by the Society.

The Officiating Secretary laid before the Meeting the Second Part of the 19th vol. of the Transactions of the Society.

Mr. BOUCHEZ, the assistant Librarian of the Asiatic Society, submitted to the Meeting a Manuscript Catalogue of the Society's books, with a request that it be printed.

Resolved—That the Catalogue be referred to the Committee of Papers.

SHAH KABEER UDDEEN laid before the Meeting a Manuscript copy of the *Zeech Bahadur Khanee*, with a request that the Society would join him in paying half the expense of its printing, on the same footing as it has done towards the printing of the *Sharya ul Islam*.

Resolved—That a Committee be formed consisting of Mr. H. T. PRINSEP, Mr. J. C. C. SUTHERLAND, Mr. JOHN CURNIN, Mr. JAMES MIDDLETON, and the Rev. H. PRATT, to report as to the merits of the work

Museum.—Note by Dr. McClelland —

“Skeletons, presented by the King of Oude, of an Elephant, of a Camel, and of a Tiger. The first has been indifferently prepared and worse treated, the cartilages and apophyses are detached, the former as well as some of the caudal vertebræ, and the last range of tarsal and carpal phalanges are altogether wanting.

The Camel, otherwise a valuable addition to our Museum, wants the entire caudal vertebræ, together with two pieces of the sternum, anterior part of the jaws, and corresponding teeth, together with some of the tarsal and carpal phalanges, cartilages of the ribs, &c.

The Tiger wants two caudal vertebræ, a femur, and twenty-two phalanges of the tarsus and carpus.

Skeleton and skin of a Kangaroo prepared from a specimen presented by Mr. H. T. PRINSEP.

The skin of a Boa, twenty feet long, presented by Ensign R. W. BIRD, 4th Regt. N. I. with the following note from the Hon. Mr. WILLIAM WILBERFORCE BIRD.

‘I have the pleasure to forward the skin of a Boa, which I have been requested to present on the part of Ensign ROBERT WILBERFORCE BIRD, of the 4th Regt N. I. for the Museum of the Asiatic Society.

When the Boa was shot, it measured 21 feet, in length. It had swallowed a spotted Deer, which was taken out of the inside, not too much decomposed for the spots in the skin to be quite distinct. Where the Deer was, the skin measured three feet one inch across.

(Signed) W. W. BIRD.’

An adult specimen of *Antonyx* from Assam where they are common, presented by Captain JENKINS, and the more valuable as that in the Museum appears to be a young ungrown animal."

Oriental Publications, Antiquities, &c.

Read a letter from J. MUIR, Esq. recommending to the Society to procure a copy of the *Pseudo-Vedas*, composed by the Romish Missionaries on the Coromandel Coast,

Seharunpoor, August 13th, 1839.

MY DEAR SIR,—I last year wrote to Mr. PRINSEP and the Rev. Professor MALAN, former Secretaries to the Asiatic Society on the subject of the *Pseudo-Vedas*, composed by the Romish Missionaries on the Coromandel Coast, in the hope that steps might be taken by the Asiatic Society to procure from Madras or elsewhere a manuscript copy of the work, for their own library. I now take the liberty of addressing you on the same subject, and of offering the sum of 25 Rupees towards the purchase or transcription of the manuscript, if the Asiatic Society of Bengal see fit to adopt any measures for this purpose.

The Society has already admitted into the 14th volume of its *Researches* a Dissertation on the subject of these *Pseudo-Vedas*, and the literary interest attaching to them, is, I think, sufficient to justify this application to the Society, to take steps for rendering them accessible to its members. It seems, at the same time, to be desirable that the reasonings of the Romish Missionaries on the subject of their discussions with learned Hindoos should be brought within the reach, and made available for the use of those who are labouring to promote the same cause at the present day

I remain, My dear Sir,

Yours faithfully,

J. C. C. SUTHERLAND, Esq. }
Secy. As. Soc. Bengal, &c. &c. }

J. MUIR.

Resolved—That the Secretary be requested to address the Rev. DR. WILSON of Bombay, soliciting his aid in obtaining a copy of the work.

Read a letter from L. WILKINSON, Esq. urging the printing of the *Siddhants*.

To W. B. O'SHAUGHNESSY, Esq.

Officiating Secretary to the Asiatic Society, Calcutta

SIR,—I have the pleasure to forward to you by Dawk Bhanghy four copies of a very admirable little disquisition on Caste, by a learned *Boddhist* of olden times, who exposes the weakness of the arguments on which the institution rests, in a most irresistible manner. I beg you will be so good as to present one copy in my name to the Society, and accept another for yourself.

The other two I beg you will present to any gentlemen most interested in exposing the evils of the institution. They will no where find arguments of a like cogency to a native's apprehension. They will do well therefore in studying the work.

I shall be very much obliged to you if you will let me know what your Society thought of my proposition for printing the *Siddhants*, the *Gruhun Laghuu* with *Mullaris Teeka*, and the *Rekha Gunit*. Since I wrote to you I have been favoured by some friend unknown to me, with a copy of the *Beeja Gunit* or *Algebra* of *Bhascur Acharyu* printed at Calcutta, thus only three instead of four works remain to be printed. I lately submitted a proposal to Government and also to the Agra School Book Society to the like effect, as I did through you, to the Asiatic

Society. The Agra School Book Society are most anxious to get these works printed, and Lord AUCKLAND I understand received the proposal favourably. By all parties agreeing to take a certain number of copies, the share of the expense on each will be too trifling to deserve consideration.

Believe me, My dear Sir,
To be yours very faithfully,

L. WILKINSON.

Resolved—That the subject be referred to the Committee of Papers.

Read an application from NEEMCHAUND SHEEROMONEE, demanding remuneration for correcting the proofs of the *Mahabharata*.

Resolved—That the application be referred to the Committee of Papers

Physical.

Read a letter from Messrs. FRASER, MACDONALD and Co. forwarding a claim of Mr. W. SCOTT of Singapore, for Co's. Rs. 240-3-9 for expenses incurred by him in keeping the register of the tides of that place.

Resolved—That the Society recognize and discharge this claim in question.

Read the following letter from Mr SCUNCE regarding some Geological specimens forwarded to the Society.

MY DEAR SUTHERLAND,

I am despatching to you some things that look like Geological specimens, and from the circumstances under which they were found, what I infer to be relics of some of the ancient epochs which mark a Geologist's History of the world. The largest and most important—if it be real—of the specimens, seems to be the remains of an animal of the turtle kind: though in a much larger scale than the modern turtles or tortoises. The size however will not disprove identity, if there be other marks sufficient to guide the judgment of one acquainted with Natural History. I knowing nothing of such matters, am merely led by the appearances which the specimen exhibits of animal conformation—the shape and relative position of the parts, and the peculiar marks of some of the parts are such, as not I think, to be inanimate concretions accidentally formed in a sand hill. The specimen was broken before I discovered it—and I sent my gardener with insufficient instructions to dig out the remainder. He brought me consequently a heap of fragments, and what I send you are such parts as I could put together. I have packed the pieces in such a manner that you will be able, I dare say to trace the form they assume. When put together, they form two distinct portions, and of these I shall enclose pencil sketches that may help you to “pick up the pieces.” I send also several unconnected bits of the same specimen; in one of these you will detect distinct traces of a claw—and in another what looks like a paw in relief. In this latter you will observe corroborative evidence of animal existence in the evident delineation of five fingers or toes, and also marks of spurs or nails. I send also in another box an *entire* fragment—that is, a portion just as it lay in the hill. My idea of the specimen is that it exhibits the external form of the animal, and the fossilization as we now see it, was effected during, or in consequence of, animal decomposition. I cannot detect how far the hardened mass may be a type of the—so to call it—turtle shell. The last specimen I have mentioned will shew you that the fossil was, as it were, a case or mould—enclosing fine white sand. Externally it was included in a stratified deep brown sand hill, to the depth of forty or fifty feet below the surface.

I also send a piece of charred wood, I found it in a position which makes me attach to it some importance. I discovered it in a bed of firm blue clay beneath successive strata of sand and clay, and some twelve or fourteen feet from the surface. The site externally is a swelling hillock. But the most extraordinary circumstance attending this specimen is, that while it was imbedded in and beneath strata that must have been deposited while the surface was exposed to repeated inundations, if not uninterruptedly overflowed, there are what I take to be undoubted marks of heat and fusion—not merely in the wood being charred—but in a *fused crust* an inch or two above where the wood lay. This crust generally speaking is not the thickness of two rupees: but is spread as regularly as any of the layers of clay and sand. I observed however that it seemed to *run* as fused matter generally does, making its way into crevices, and gathering into a mass. But what satisfies me more strongly of the fused origin of this crust, is that just above the charred wood—an inch or two,—it appears to have *trickled* in a state of fusion *through* the clay, making a hole for itself scarcely a quarter of an inch wide. I send specimens of the clay, the crust, and of that portion of the clay, through which the fusion ran. I suppose that the heat from the fused liquid above was sufficient to char the wood. Willing to send you the specimen as entire as possible. I have not scraped it or cleared it so as to ascertain the appearances of the wood.

There are also some smaller specimens of what I suppose to be quondam shell-fish. One I am told is a muscle—if a shell, it is at all events a bivalve. the two shells separate—and the one is fleshy looking. These shells I found also in a strata of clay and sand more or less hard—and it seems odd, that when broken, they emit a strong *sulphureous* smell. I am too ignorant on such subjects to know whether these things have any value; you will judge when you see them, and if worth while, I should be glad, if you offered them to the Society.

I am

Yours very sincerely,

A SCOTCE.

Before the Meeting broke up Dr. O'SHAUGHNESSY, exhibited several Photogenic drawings prepared by himself, and in which a solution of gold was the agent employed. A more detailed notice of the experiments described will appear in a subsequent number.

[We cannot dismiss the subject of the Proceedings of the October Meeting, without adverting to their having been distinguished by the first exhibition in the Society's apartments of Colonel M'LEOD's, magnificent model of the Nizamut Palace of Moorshedabad. We strongly recommend all those who can value a first rate practical lesson in classical architecture to visit this triumph of taste and skill. Aided by the "Report by the Surveying Committee," published in our last number, the visitor can acquire by an hour's study more correct ideas on some of the noblest features of the Orders observed in this structure, than he could derive by any amount of study, from books or plates, or could gain without great difficulty, even from the building itself.—Eds.]

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 93.—SEPTEMBER, 1839.

ART. I.—*Sanscrit Inscription on the Slab removed from above the Kothoutiya gate of the Fort Rohtas. By the Editors.*

In our May number, we presented our readers with an interesting letter from Mr. RAVENSHAW, communicating some inscriptions collected in *Behar*. Mr. RAVENSHAW notices the Persian Inscription over the gateway of the palace on the summit of the fort of *Rohtas*. This informs us that the palace was built by RAJA MAN SING. The date of the inscription is the 28th day of the 7th month of 1005, H. Æ., or about the middle of April, 1597 A. D. Mr. RAVENSHAW adds, that the Sanscrit inscription over the Kothoutiya gate of the fort had been taken to *Chupra* by Mr. W. EWER, and was then on the premises of Mr. LUKE. It has since been forwarded to the *Asiatic Society*, and we are thus enabled to present our readers with a transcript and translation.

The inscription gives the following genealogy of the TOMARA family for eleven generations, and twelve Rajas.

VIRA SINH,
UDDHARAN,
GANA PATI,
HANGARA SINGH DEVA.
KIRTI SINH,
KALYANA SAHI,
MANA SAHI,
VIKRAMA SAHI,
RAMA SAHI,
SALI VAHANA, left two sons.
SYAMA SAHI and VIRA MITRA SEN.

VIRA MITRA SEN, the last, succeeded his brother, and is stated to have conquered from SHER KHAN the fortress of *Rohitaswa*,—to the great astonishment of the Emperor of *Delhi*. He rebuilt it, and it became known by his name. He erected in it a row of lofty temples, in which he located SIVA under the name of MITRESWARA, and he also in 1688 Sumbut, or 1631 A. D., built a palace and a *Mundira* in which he located DURGA, and it was by his order that the Poet SIVA DEVA of *Maithila* (celebrated at the Court of *Delhi*) composed, in honor of his illustrious family, the verses which were found engraved over the *Kothoutiya* gate. This is named from the neck of rock which joins the hill to the table land. BUCHANAN mentions this inscription,* but evidently was not acquainted with its contents. He describes it as confirming the facts obtained from the Persian inscription, and as contemporary with it. But in reality there is no mention of the Viceroy MAN SINGH, and the date 1654 Sumbut, quoted by BUCHANAN, seems to have been obtained by the addition of 57 to 1597, the Christian year which corresponds with 1005, H. Æ. in the *Sanskrit* inscription the figures 1688 are very distinct, and this year also results from the conventional numeral words used, “*vasu dwana shat chandra*.”

The bold assertion that VIR MITRA took the fort from the formidable SHER KHAN is not justified by history; and if we assume on the evidence of the stone, as we perhaps may, that VIR MITRA was living in 1631 A. D. it is impossible that he could have been opposed in war to the celebrated *Pathan* emperor who died in 1540. We are left then to surmise that VIR MITRA SEN may have been a native chieftain of that part of *Behar*, and perhaps entrusted by the *Mohammedan* ruler with the charge of the fort. The invention and adulation of the poet has supplied the rest.

Though the slab should be thus convicted of error and exaggeration, there may still be some historical facts pointed at. In the 7th verse the grandfather of VIR MITRA's great-grandfather is represented to have sustained the king of *Yavanapura* (*Jionpoor*),—the king of the east, against the emperor of *Dellu*. The dominion of the *Jionpoor Muslim* kings extended to *Behar*. Allusion is probably made to the emperor BELOLI, and HOSEN SHAH the king of the East. After a long struggle the latter was in 1478, driven to seek shelter with ALLAHUDDIN the ruler of Bengal. It may be observed that the Hindus applied the term *Yavana* to denote their *Afghan* invaders, though this term properly belongs to the Greek or *Ionian*. We have in

* Buchanan, vol. iii. p. 432

rendering the seventh stanza, ventured to construe the concluding part as alluding to the use of artillery, by the modern name of *top*. The words admit of a different version, and we are not satisfied that we are justified in the liberty taken. MANA SAHI, the father of the great-grandfather of VIRA SINGH, was the lord of *Gopachala*, indicating probably a neighbouring hill fort. If any gentleman near *Rohtas* would institute an inquiry as to whether any of the *Tomara* family there still exists, and if their family traditions or records in any way square with the particulars of the inscription,—an important service would be rendered.

We learn from the 12th verse, that JALALUDDIN ever designated MITRA SEN and his brother as 'the unique heroes.' JALALUDDIN was the name of AKBAR, who died in 1605 A. D. The style of these verses is modern, and their merit is rather mediocre.

SHER KHAN is stated by BUCHANAN to have taken the fortress of *Rohtas* by surprise. He mentions that the tradition is, that it was wrested in 1534 A. D., from the last *Hindu* Emperor of *Hindustan*, a descendant of PRATAPA DEVALA,* to whose family the fort belonged. On what authority BUCHANAN has elevated the descendant of the chieftain of *Japila* into the last Hindu emperor, does not appear. In closing this article, we would remark that the *Rohtas* slab gives a useful lesson of caution to distrust panegyric inscriptions.

The removal of slabs from ancient buildings and temples has been condemned by the good sense of the Asiatic Society, and we suggest that the *Rohtas* slab should be restored to its proper place.

तस्यै नमः ॥

स्तुत्वा वागीश्वरीयं चरणसरसिजं कृष्णदेवञ्च नत्वा
 कृत्वा चित्ते गणेशं त्रिभुवनजननीं भावयित्वा च दुर्गां ।
 वीरश्रीमित्रसेनचित्तिमुकुटमणेरान्नया पाण्डुवंशे
 सुखातान् गोणवंश्यानहमिह कियतः कीर्तितः कीर्त्तयामि ॥१॥

* See our May No.

विख्यातः सोमवंशः समभवदथ यः पाण्डुवंशस्ततोभू
दंशः श्रीतोमराणां समरविजयिनां कोटिशो यत्र वीराः ।
तत्र श्रीवीरसिंहः समजनि समरे येन जित्वा नरेन्द्रान्
दुर्गे गोपाचलाख्ये वरचि शतमुखी प्राज्यसाम्राज्यलक्ष्मीः ॥२॥

पुत्रस्तस्यानु भूपः समभवदवनीमुद्धरन्नुपतेजाः
अष्टैर्विद्वद्भिरचोद्धरण इति कृतं नाम यस्योचितार्थः ।
तत्सूनुर्वैरिवीरचितिपतिदमनादीरमो वीर एकः
श्रुत्वा यद्वीरभावं सुरपतिरधिकं कम्पवान् स्तम्भितो भूत् ॥३॥

तस्य प्रत्यर्थिपृथ्वीपतिनतिविलम्बमौलिमालाङ्घ्रिपद्मः
पद्माविश्रामभूमिर्गणपतिरभवत् सूनुरन्यूनतेजाः ।
यस्मिन् गोपाचलस्थे कथयति समभून्नैव दिक्षीश्वराणां
चेतोऽप्यत्र प्रयातं किमुत बलमहो कोऽपि यस्य प्रभावः ॥४॥

तत् सूनुः समभूदपूर्वमहिमा हेमाद्रिवत् सुस्थिरः
संग्रामेऽर्थिजनस्य दैवततर्कः श्रीशौट्यधैर्याश्रयः ।
यः सिंहोत्पलमृगानिवारि नृपतीनुन्मर्दयन् दोर्बलात्
प्राप्तो ऋजुरसिंहदेवपदवीं ख्यातां जगन्मण्डले ॥५॥

तत् पुत्रः कीर्त्तिसिंहः समजनि न भयाद् यस्य संग्रामलीलां
चक्रुर्वैरिचितीन्द्रास्त्रिजगति विदितौ यस्य दानप्रतापौ ।
यस्मिन्नेकान्तचित्ते भजति हरिहरौ कम्पिता शक्रलक्ष्मी
र्यद्वोर्दण्डप्रचण्डं धनुरभजदहो चण्डगाण्डीवश्रीमां ॥६॥

श्रीमान् कल्याणसाहिः समजनि तनयस्तस्य यस्य प्रसादात्
संग्रामे प्राप्य कान्तात् सुरपुरवनितानन्दनान्तःस्फुरन्ति ।
सौख्यं दिक्षीशमाजौ करितुरगघटाटोपसंघटनध्ये
द्राग् जित्वा शत्रुसेनां यवनपुरपतिं स्थापयामास राज्ये ॥७॥

तत् सूनूर्मानसाहिर्दिशिदिशिविदितोद्दामदानप्रतिष्ठः
 शक्रोऽयं किं कुवेरो नुलिरिति विदुषां संशयो यच्च वृत्तः ।
 यस्मिन् गोपाचलेन्द्रे विजयिनि विविधां कीर्त्तिमुद्गातुकामा
 प्रोद्यत्संगीतरागा ध्रुपदशतपदा भारती संबभूव ॥८॥

श्रीमद्विक्रमसाहिरद्भुतयशास्तत् सूनूरासीदभि
 प्रोद्यत् प्रौढतरप्रतापतपनप्रोत्सारितारिव्रजः ।
 यद्दानेन सुरद्रुमादिरभजत् काष्ठायितो मूकतां
 यत् कान्त्या तुलितः सुधांशुरभवद् व्योमाश्रितो लाघवात् ॥९॥

श्रीरामसाहिरभवत्तनयोऽथ तस्य
 प्रत्याशमुल्लसितविक्रमशौर्यधैर्यैः ।
 यन्नामनि अतिपथातिथितामुपेते
 सद्योधनुः खलति पाणितलात् परेषां ॥१०॥

श्रीशालिवाहन इति प्रथितोऽस्य पुत्रः
 प्रख्यातकीर्त्ति रतिदानदयाविवेकैः ।
 यः सङ्गरे बह्वविधानृपतीन् निहत्य
 प्राप्तः सुरेश्वरविभूषितमासनाङ्गं ॥११॥

तस्य श्रीश्यामसाहिः क्षितिमुकुटमणिर्मन्त्रसेनश्च पुत्रौ
 त्रैलोक्यख्यातकीर्त्तिं प्रतिबलजलधेरन्तरौर्वायमाणौ ।
 दाने युद्धे दयायां हरिहरचरणाम्भोजपूजाप्रसक्तौ
 नित्यं यावेकवीरौ कथयति सततं साहि जलालदीनः ॥ १२ ॥

तत्र श्रीश्यामसाहिर्दिवमगमदभिद्योतयन् स्वर्गमार्गं
 प्रह्लादोवाम्बरीषो बलिरिति किमुवेत्येवमुक्तोमुनीन्द्रैः ।
 वीरश्रीमन्त्रसेनः क्षितिपतिरनुजस्तस्य तद्विप्रयोगे
 व्ययोऽप्युयैः प्रतापैः प्रतिनृपतिचमू चासयन् पाति पृथ्वीं ॥ १३ ॥

यःप्रद्योत् प्रौढवीर्यो भुजबलविवलङ्गीमसेनो बलेन
द्राग् दुर्गं रोहिताश्वे स्वकमकृत कृती सेरषानं विजित्य ।
नैतत् कोऽपि व्यधासीदिति चकितमतिर्विच्य दीक्षीश्वरोऽपि
प्रोवाचान्येपि वीराः समरविजयिनो विस्मयं प्रापुश्चैः ॥ १४ ॥

अस्य श्रीमित्रसेनचित्तिमुकुटमणेर्यानसङ्कल्पवार्भि
र्विद्वद्धारिद्रु दावानलवह्नलशिखाशान्तिमभ्याजगाम ।
उत्पन्ना साथ वैरिचित्तिपतिभवने तदधूनेत्रनीर
प्रौढप्रोद्यत् खवन्तीततिभिरपि भृशं स्नानिमानं प्रपेदे ॥ १५ ॥

सोऽयं श्रीमित्रसेनचित्तिमुकुटमणिभूतले कल्पवृक्षो
दुर्भिक्षोपद्रुतानामशनभरणयोर्ब्राह्मणानां प्रदानात् ।
दायंदायं तुलाभिस्तुलितमगणितं स्वर्णरौप्यादि वेश्म
प्रोक्षैर्निमाययित्वा द्विजवरतिलकं स्थापयामास काश्यां ॥ १६ ॥

एवं दाता वदान्योबलगुणनिलयो मित्रसेनो नरेशो
भग्नं श्रीरोहिताश्वं नवमकृत कृती यस्य नाम्नैषदुर्गः ।
किञ्च प्रोक्षैर्विधायोद्भटमठघटनां तत्र मित्रेश्वराख्यं
शम्भुं संस्थाप्य दिव्योपवनमिह जयन्नन्दनादि व्यधासीत् ॥ १७ ॥

सौधं भूमीन्दुचूडामणिरकृत वसुदन्द्र षट्चन्द्र १६८८ संख्ये
वर्षे श्रीविक्रमार्कचित्तिपतिगणिते संवते सम्मतश्रीः ।
कृत्वैतन्मन्दिराख्यं त्रिभुवनजननीं स्थापयामास दुर्गा
मेतत् काव्यानि चक्रे मिथिभुवि विदितः कृष्णदेवात्मजन्मा ॥ १८ ॥

दीक्षीन्द्रादिसभासु लब्धयशसो वैदेहभूमीभुवः
श्रीकृष्णार्पितचेतसस्त्रिजगतीं तत्त्वेन संपश्यतः ।
धीरश्रीशिवदेवपण्डितकवेः पद्यानि हृद्यान्यमू
न्यानन्दं जनयन्तु सत्सुमनसां प्रीयुषधारा इव ॥ १९ ॥

अस्ति त्रैलोक्यलोकोत्तरविधिरचनादृष्टदृष्टान्तसारः
 प्राकारैः स्वर्णभूमीधरद्वय विलसत्सौधसौधाधरश्रीः ।
 मूढा विन्ध्यस्य दिव्योपवनघनपुरीकूपकासारहारः
 सर्वान्नोत्पत्तिभूमिर्भुवनभयहरो यत्र विप्रो गदेन्द्रः ॥ २० ॥

सन्तः सन्तोषमुदिता राजानो धर्मतत्पराः ।
 प्रजाश्च सुखिताः सन्तु सुभिन्नच्यवस्तु सर्वदा ॥ २१ ॥

शुभमस्तु श्रीरस्तु ॥

TRANSLATION.

1. Salutation to HER. By the order of the hero, the illustrious MITRA SEN, a gem on the diadem of the universe, I eulogize for their glory, some celebrated scions of the Gona race in the lineage of PANDU, having first praised the lotus of the feet of SARASWATI, and having prostrated myself before the divine KRISHNA, meditating on GANESA, and contemplating DURGA, the mother of the universe.

2. Renowned was the Lunar race. From the lineage of PANDU sprang the TOMARAS, victorious in war,—in which are millions of heroes. In this was Vira Singh born, by whom, when he had conquered kings, were wrought many imperial fortunes looking in a hundred directions.

3. His son was that great hero of resplendent glory, to whom the wise had fixed the appropriate name of UDDHARAN, as if upholding the world. His son was VIRAMA, a hero singular from his subjection of hostile warrior kings. Hearing of his prowess, INDRA, trembling excessively, stood aghast.

4. His son was the illustrious GANA PATI, the shrine of the lotus-born goddess, at whose feet glided the coronal gems of hostile kings in their prostrations. Of whom, how vast was the power; placed as he was in his fort, and saying—"the thought even of the lords of Delhi never reached this place."

5. His son was unprecedentedly great, firm in war, like the snow-clad mountain,—the divine tree to the supplicant—the asylum of valor and constancy; who crushing by force the kings his enemies, as a lion does the deer, got the title of HUNGARA SINGA DEVA, celebrated throughout the world

6. To him, a son KIRTI SINGH was born, from fear of whom, kings ceased to fight,—whose liberality was celebrated in three worlds,—whom intently adoring HARI and HARA, trembled the fortune of INDRA,—in whose brawny arms a terrific bow rivalled the grace of the awe-inspiring arc of ARJUN.

7. To whom was born an illustrious son KALYANA SAHI, by whose favor the nymphs of paradise, in the bower of INDRA, revel in joy with lovers obtained by the fate of war—who happily established in his kingdom the lord of *Yavanapur*, after he had quickly overthrown in war the king of *Delhi* and his hostile army, in the conflict of artillery and squadrons of horse and elephants.

8. His son was MANA SAHI, renowned in every quarter, and celebrated for his generosity. “What is this INDRA, KUVERA, or BALI?” Such were the doubts of the learned: while him the lord of *Gopachala* conquering,—BHARATI in strains of ascending melody modulated in the different harmonic notes loved to celebrate his complicated glory.

9. His son was VIKRAMA SAHI, surpassing fame—the crowd of whose enemies was dispelled by the heat of his intense and culminating glory;—in consequence of whose liberality, the divine tree and other sources of gifts withering as it were, became abashed.

10. His son was RAM SAHAI, whose prowess, valor, and perseverance, shewed in every quarter,—at whose name, a guest unwelcome to their cars—forthwith slipped the bows from the palms of his enemies hands.

11. His son was SALI VAHANANA, celebrated for his excessive generosity and clemency,—who when he had in war overthrown many kings, shared the throne, graced by the regent of the gods.

12. His sons were SYAMA SAHI, a gem on the diadem of the universe, and MITRA SENA, renowned in the three worlds,—volcanoes in the ocean of their enemies’ army,—fervent in gift, war, and mercy—and votaries of the lotus of the feet of HARA and HARI.—Ever does JALALUDDIN SHAH designate them as unique heroes.

13. SYAM SAHI died illuminating the roads of heaven, designated by holy saints as PRAHLADA AMBARISHA or BALI. On his death, VIRA MITRA SEN the younger brother of that monarch, though grieved, protects the world, awing the armies of hostile kings by his intense majesty.

14. Apt to baffle the martial throng by force of his arm,—which experienced warrior of unrivalled prowess, having conquered SHER KHAN quickly made his own the fort at *Rohitaswa*: beholding that, the

astounded emperor of *Délhi* exclaimed, no one has ever effected the same—other conquering heroes also felt intense astonishment.

15. On occasion of his vows of gift, by the libations of that *MITRA SEN*, a gem on the diadem of the world were extinguished—the many flames issuing from the fire of the poverty of the learned. That produced in the house of hostile kings, often was suppressed by streams of tears profusely gushing from the eyes of their wives.

16. From his donation of support and food to famine-stricken Brahmins, a divine tree on earth—that *MITRA SEN*, a gem on the diadem of the world, repeatedly giving precious metals, not counted, but weighed, when he had constructed a house at *Kashi*, established in it a pre-eminent Brahmana.

17. So generous, eloquent, and the shrine of valor and virtue—*MITRA SEN*, by whose name this fort is known, rebuilt the decayed *Rohitaswa*, having erected a row of lofty temples. He located in them an image of *SIVA* under the name of *MITRESWARA*, and made a divine garden here surpassing the bower of paradise.

18. In the year 1688 of the era of the king *VIKRAMARKA*, that gem on the crest like the moon of the world, constructed the palace. Having constructed the building denominated *Mandira*, he located in it *DURGA*, the mother of the three worlds. These verses were made by the son of *KRISHNA DEVA*, known in the *Muthi* territory.

19. Like streams of nectar to gods, may these verses impart delight to virtuous men,—these verses of the poet *SIVA DEVA*, celebrated in the court at *Delhi*, born in the *Vaideha* province, a votary of *SRI KRISHN*, contemplating as reality the three worlds.

20. Like a golden mountain with its ramparts, is the summit of *Vindha*, whose palaces reflect the beauty of the nectar-fraught luminary—the epitome of similies exhibited in composition according to the rules most approved in the universe,—abounding in bowers, dens, lakes, wells, and pools,—a land of plenty, dispelling worldly fear, where lived the Brahmun *GADENDRA*.

21. May the virtuous be gratified—kings intent on the law—the subjects happy—and may there always be abundance.

Be there welfare and good fortune.

ART. II.—*On Camel Litters for the Wounded.*—By H. PIDDINGTON, ESQ.

To the Secretary to the Government of India, Military Department.

SIR,—I have to beg you will do me the honor to submit, for the consideration of the Honorable the President in Council, and, if approved, for transmission to the Right Honorable the Governor General of India, the accompanying Memorandum and sketches. The importance of the subject to the interests of humanity, and to the movements of a military force, will, I trust, excuse the intrusion of it upon his Honor's attention.

CALCUTTA,
15th February, 1839.

I have, &c.

H. PIDDINGTON.

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*Memorandum.*

In the countries towards which the Army of the Indus is now advancing, it is nearly certain that no extra dooly-bearers for the carriage of the sick and wounded can be procured; and of even those taken with the force, it may be doubtful if they can be kept long together should the advance be prolonged far beyond the frontier. The sick and wounded then would, in this case, be left without the means of carriage, and not only many valuable lives might be so lost, but important military operations might be greatly impeded, or even prevented. I found the other day, in the course of my reading, what appears to be so simple and cheap a plan of providing against this cruel aggravation of the miseries and losses of war, that I am induced to lay it before the Right Honorable the Governor General, not doubting that he will allow it a trial.

The plan I allude to, is in the "*Memoires de Chirurgie Militaire du Baron Larrey*," a name standing so high in the annals of his profession for every talent and virtue which can adorn it, that nothing falling from his pen can be unimportant. I translate here the passage, which is found in vol. i. p. 278, of the "*Campagnes d' Egypte*."

Preparations for the campaign in Syria were ordered—

"The Medical Staff assembled to concert the necessary arrangements for their branch of the service in the army destined for this campaign. I was particularly occupied in providing every thing necessary to insure assistance to the wounded whom we might expect on such a painful and perilous expedition. The means of carriage were the first object of my attention, for merely dressing the wounded on the field of battle was

insufficient; they were moreover, to be placed out of the reach of the Arabs, and to be saved from the horrors of hunger and thirst, to which they would have been exposed if not promptly carried off. We had to employ for this purpose the camel—the only beasts of burden in the country; and to render the means of carriage easy for the wounded, as well as light for the animals, I had a hundred baskets\* made cradle-wise, two for each camel, which were carried, one on each side, suspended by elastic straps. They were so made that they did not in the least impede his paces, or his movements, and yet were long enough, by means of a lengthening flap on hinges at one end, to carry a wounded man lying down at full length.”

In adopting this plan, the simplest methods seem to be those most likely to succeed, and to be least subject to get out of order; and I should suggest that a few be made of basket-work—nothing is so durable as the entire ratan if it can be procured,—as well as some of the frame-work kind shewn in the drawing.

For the simplest sort a cradle-like basket, higher at one end to raise the head comfortably, and a tarpaulin for rainy weather, seem to be all that is necessary. The straps or slings for this, should, I think, be fastened to bent iron bars going round the cradle, (not fastened to the sides of it,) and turned into a ring at the *inner, upper* side, sufficiently strong and properly placed. A spare ring or two may be added when necessary for steadying the whole, and a short plank should be placed outside across the bottom, where the iron bars take, that they may not cut in upon the basket.

A frame of light wood, with a corded net-work bottom, should be placed inside, and a quilted mattress and covering; the last pretty wide, so as to be doubled if required, will be sufficient for the inside. There should also be two pillows, one for the head, and another to lay at the side, if required by the patient to steady himself against the motion of the animal.

Any intelligent officer accustomed to Camel-carriage will be able to arrange the lesser details of the necessary ropes, spare slings, &c. as well as the fitting of the curtain and tarpaulin, and a medical officer will easily add those necessary for the safety and comfort of the wounded and sick.

H. PIDDINGTON.

CALCUTTA, 12th February, 1839.

\* “*Paniers disposés en forme de berceau*” are the words used; though the Baron’s plate represents frames with curtains, which would have been expressed by the words “*Cadres avec des rideaux*.” Probably the plate may represent a better sort for the officers, and the Baron has forgotten to mention this :



## MILITARY DEPARTMENT.

*To the Officiating Secretary to the Government of India,  
Military Department, Calcutta.*

SIR,—I have had the honor of receiving and laying before the Right Honorable the Governor General your letter No. 473 of the 25th ultimo, with its enclosures herewith returned, from Mr. Piddington, submitting a memorandum, with sketch of a Camel litter for the conveyance of the sick and wounded in the Army of the Indus.

In reply, I am instructed to convey the expression of His Lordship's acknowledgments to Mr. Piddington for his useful communication, a copy of which will be forwarded to His Excellency Lieut.-General Sir John Kean, K. C. B. Commanding the Army of the Indus, for information.

J. STUART, *Lt. Col.*

ART. III.—*Note by DR. KEAN of Moorshedabad, on DR. STEWART'S  
Table of Mortality among Hindu Females.*

*To the Secretaries of the Asiatic Society.*

SIR,—The table furnished by Dr. Stewart, and published in the Journal of the Society for April last, may be expected to attract much attention. Its results are unexpected and startling. Considering the ignorance that prevails on the subject of Indian statistics, the unexpectedness of such information may be no argument against its accuracy; but the frightful mortality which the Table exhibits as arising from one source, will lead many to doubt its correctness, and all, to wish that there may have been some error in the data on which it is based.

We learn from the Table that *one-fifth* of the female population of Bengal die in childbed. But we know that only a *portion* of the female population *can*, during any given period, suffer from this cause of mortality. This portion might perhaps, without involving much error, be estimated at *one-third* of the whole; and if so, a mortality amounting to *one-fifth* of the female population will be equivalent to *three-fifths* of the portion actually liable to that cause of mortality;—in other words, out of every *five* of the mothers in Bengal, *three* will die in childbed.

It is not however by arguments of this kind, nor indeed by arguments of any kind, that the truth of the Table can either be established or overturned. A census ought to be taken, and accurate

registers kept, of such casualties as occur within the limits. A general census, though desirable, is not absolutely necessary on the subject.

In replying to the inquiries of the Secretary to the Prison Discipline Committee, the writer of this took the opportunity of suggesting the advantages that might be obtained from taking the census and keeping registers in particular Zillahs, or in limited districts around every Jail. It is obvious that such registers would have been available for many purposes, but the advantage then mainly insisted upon, was the facility that would have been afforded for comparing the mortality in the Jails, with that in the surrounding districts. It is understood that the suggestion was referred by the authorities to the Sudder Dewanny, who discouraged it, on the ground that it would lead to vexatious domestic intrusions. Convinced that the plan might be carried into execution without causing either vexation or annoyance, he selected a village containing 762 inhabitants, in the neighbourhood of the Moorshedabad Jail, and kept a register of the births and deaths for one year. During this period no death occurred from childbirth. Next year the register was made to include another village, embracing altogether a population of 2,778 persons, and during this period there was entered only one death in childbed. The registers for the first year were placed in the hands of your late Secretary by Mr. Adam, and are doubtless to be found among the papers of the Society.

These registers are not alluded to here as any authority on this subject, but merely as a practical evidence that they can be kept without causing trouble or inconvenience to any one. It is to be hoped, therefore, that Government will speedily institute measures for ascertaining the truth on this important question.

The above observations are by no means intended to convey the idea, that the mortality among native females from the cause assigned is not very great, on the contrary, it is believed to be excessive; nor is it likely to be otherwise till means are taken to disseminate among them something like information, and to introduce something like rational practice in reference to obstetric medicine. Yours truly,

MOORSHEDABAD,  
11th October, 1839.

A. KEAN.

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Explanatory Note by DR. DUNCAN STEWART, Superintendent General of Vaccination.

Mr. Kean has very justly pointed out a blunder in the note which accompanied my Table, published in the April number of the Journal,

which certainly conveys to the reader the erroneous impression that all the 1328 cases of "childbed disease" were mothers. -

I took the earliest opportunity in my power of rectifying the misapprehension which this gave rise to, as soon as it was pointed out to me, by addressing a brief note to the *Englishman* newspaper on the subject.

If you will do me the favor, in noticing Mr. Kean's letter, to refer him to the paragraph which I have marked in the accompanying printed copy of my Evidence before the Municipal Committee, and the annexed Table, he will perceive that the mistake has arisen from the careless omission of an explanation there given of the native term used to denote that class of diseases.

"The term employed to include all accidents of this nature, and applied indiscriminately to the infant and the mother, (*antari-rogi*) is "one which attributes the fatal termination of such cases to demoniacal influence. It is not applied to casualties after the first month, and we may therefore conclude that the picture here given, distressing though it be, does not exhibit the total amount of suffering, and of death, caused by the barbarity, ignorance, and prejudices, of the Hindoos in their management of lying-in women. The number of still-born children is not given at all, nor is it, I fear, ascertainable. The picture is sufficiently frightful, which shows, as matter of fact, that of 1801 children who died during the first year of life, 1237 died from the accidents of childbed. Out of 88 mothers who lost their lives in childbed, four appear to have been so young as thirteen, two aged fourteen, six aged fifteen, and eight died between the ages of fifteen and twenty."

By reference to the annexed Table it will be seen that of the 1328 cases of "childbed" mortality, 1237 were infants under one year of age; and referring again to the Table in your April Journal it will be seen that most of these were not one month *ill*, and probably *not older*; 356 are stated to have died on the first day of illness; 308 on the second; 146 on the third, and so on. Neither the Table now sent nor the former has reference to the ratio of "mortality to population:" the imperfection of the census, which does not assign the ages of the *living* on any particular day, renders this impossible. The present Table exhibits merely the comparative prevalence and mortality of particular diseases, and the influence of these as affected by sex and age. The Table in the April Journal was drawn up from the same data, in order to discover the intensity of particular diseases, as evinced by their *duration*, before causing death.

Table of 20,000 Hindoo deaths, showing the mortality by particular diseases, and at particular ages of both sexes.

| Ages. | Fevers. | Small-pox. | Dysentery. | Cholera. | Spleen & fever diseases. | Pulmonic diseases. | Cerebral and nervous diseases. | Constitutional diseases. | Accidents & anomalous. | Childbed diseases. | Total. | | Total. | Per centage of ages. |
|--------------------------|---------|------------|------------|----------|--------------------------|--------------------|--------------------------------|--------------------------|------------------------|--------------------|--------|----------|--------|----------------------|
| | | | | | | | | | | | Males. | Females. | | |
| 1 year, | 276 | 41 | 126 | 86 | 5 | 7 | 10 | 3 | 10 | 1,237 | 983 | 818 | 1,801 | 9.005 |
| 2 " | 152 | 21 | 195 | 75 | 13 | 6 | 4 | 10 | 10 | 3 | 254 | 235 | 489 | |
| 3 " | 167 | 26 | 197 | 78 | 13 | 1 | 8 | 13 | 6 | 0 | 274 | 235 | 509 | |
| 4 " | 113 | 30 | 127 | 75 | 5 | 2 | 1 | 5 | 2 | 0 | 181 | 149 | 330 | |
| 5 " | 113 | 32 | 101 | 72 | 6 | 1 | 6 | 4 | 12 | 0 | 224 | 126 | 350 | 7.38 |
| 6 " | 61 | 21 | 75 | 56 | 7 | 5 | 4 | 2 | 2 | 0 | 141 | 92 | 233 | |
| 7 " | 66 | 17 | 65 | 57 | 9 | 1 | 4 | 3 | 7 | 0 | 112 | 119 | 231 | |
| 8 " | 47 | 16 | 63 | 45 | 6 | 2 | 1 | 2 | 2 | 0 | 91 | 94 | 185 | |
| 9 " | 49 | 17 | 45 | 30 | 8 | 3 | 3 | 1 | 9 | 0 | 104 | 61 | 185 | |
| 10 " | 65 | 15 | 70 | 53 | 10 | 5 | 4 | 5 | 2 | 0 | 141 | 88 | 229 | 5.315 |
| 11 " | 54 | 13 | 21 | 31 | 6 | 0 | 4 | 2 | 3 | 0 | 88 | 55 | 139 | |
| 12 " | 84 | 24 | 59 | 66 | 19 | 4 | 3 | 3 | 9 | 0 | 150 | 120 | 270 | |
| 13 " | 39 | 11 | 13 | 36 | 12 | 4 | 2 | 2 | 3 | 4 | 79 | 48 | 127 | |
| 14 " | 86 | 7 | 51 | 41 | 13 | 5 | 4 | 3 | 5 | 2 | 122 | 96 | 218 | |
| 15 " | 67 | 14 | 32 | 58 | 8 | 7 | 8 | 5 | 4 | 6 | 129 | 80 | 209 | 4.815 |
| 20 " | 624 | 65 | 392 | 466 | 57 | 79 | 20 | 33 | 31 | 8 | 1,131 | 615 | 1,776 | 8.88 |
| 30 " | 1,123 | 81 | 770 | 1,293 | 51 | 197 | 42 | 42 | 25 | 37 | 2,672 | 998 | 3,670 | 18.25 |
| 40 " | 869 | 17 | 742 | 896 | 21 | 148 | 18 | 62 | 61 | 26 | 1,995 | 898 | 2,893 | 14.65 |
| 50 " | 559 | 8 | 605 | 600 | 19 | 107 | 19 | 36 | 31 | 2 | 1,326 | 661 | 1,987 | 9.935 |
| 60 " | 463 | 2 | 577 | 308 | 10 | 67 | 21 | 46 | 43 | 3 | 970 | 570 | 1,540 | 7.77 |
| 70 " | 228 | 4 | 365 | 153 | 6 | 42 | 9 | 14 | 14 | 0 | 463 | 392 | 855 | 4.225 |
| 80 " | 256 | 4 | 627 | 137 | 5 | 71 | 34 | 26 | 13 | 0 | 511 | 665 | 1,176 | 5.98 |
| 90 " | 75 | 2 | 230 | 36 | 0 | 18 | 4 | 13 | 0 | 0 | 148 | 230 | 378 | 1.89 |
| 100 " | 32 | 0 | 173 | 16 | 0 | 7 | 0 | 4 | 2 | 0 | 62 | 178 | 240 | 1.2 |
| Total, .. | 5,672 | 488 | 5,733 | 4,773 | 311 | 792 | 233 | 361 | 309 | 1,328 | 12,347 | 7,653 | 20,000 | 100 |
| per centage of diseases. | 28.36 | 1.22 | 28.65 | 23.865 | 1.555 | 3.96 | 1.155 | 1.805 | 1.545 | 6.61 | 61.735 | 38.265 | | |

With the assistance of Captain Birch in 1837-38, the Statistical Committee of the Asiatic Society registered the births and deaths of natives in Calcutta, and the following results were obtained at the end of twelve months; viz. number of Births—2,781, whereof males 1,639, females 1,142. Of the mothers, 46 died in childbed; and during the same year the number of children under one year of age reported to have died, was 585, of whom 260 died during the first month of life. If we may suppose these children to be the same as those born in the same year and same place, the mortality is frightful, viz. 1 in every 5 for the year, or 1 in 10 for the first month.

Compare this with the statistical report of the Clinical Hospital of Midwifery in Berlin, published in a recent volume of the *Lancet*. In 2,656 labors, 1,913 children were born alive, whereof 92 died within the first month of existence, that is only 1 in 20.

The mortality among the mothers in the Berlin Hospital is not very different however from that in Calcutta; only 38 out of 2,656 died in childbed, in other words 1 in 67. If the Calcutta registers for 1837 are confirmed by farther observation, the mortality here is 1 in 60.

D. STEWART, M. D.

5th November, 1839.

ART. IV.—*On fifteen varieties of Fossil Shells found in the Saugor and Nerbudda territories.*—By GEORGE G. SPILSBURY, Esq. Surgeon, &c.*

Since the publication of my note on the discovery of the Fossil Shells near the Gour River, in the *Journal* for 1833, no notice has been sent of the children of that parent; and as I look upon myself now as a sort of Secretary for reporting Fossil discoveries of those more able, but not more willing than myself, I shall proceed to place on record a slight account of the localities from whence are derived the specimens I forwarded some months since.

On the arrival of Mr. Fraser, the Agent to the Governor General in these territories, in April last, that gentleman lost no time in making inquiries and sending out people in different directions; this led to the discovery of two other sites at no great distance from Suleya, viz.

* This valuable paper was forwarded to Mr. Jas. Prinsep, in March, 1838, but was accidentally mislaid. We are now very happy in presenting it to our readers, together with facsimiles of Captain Reynolds' excellent drawings; and additional notes lately received from Dr. Spilsbury on the same subject.—EDS. J. A. S.

B 42



A 40



C 35



F 2



100



101



102



103

H. 15



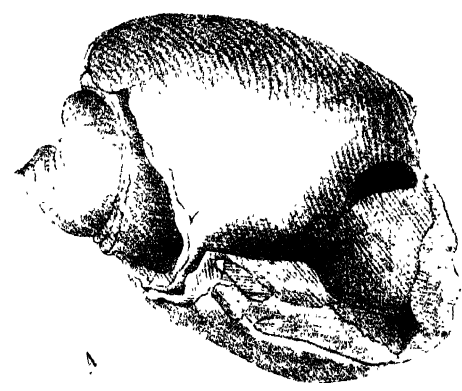
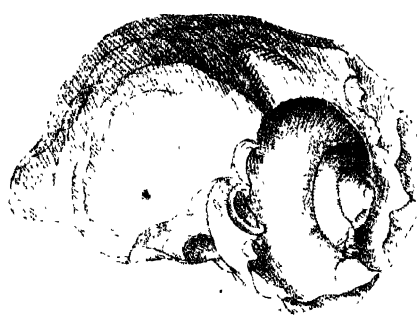
F. 10



D. 14



108
Mundrup



Dhoonra and a village adjacent, only differing in colour from the first sent you, which were a reddish brown, and the others being white and of a more calcined appearance.

Some of these Shells being shewn to a native gentleman, he said, that he had heard similar ones were to be found in Scindea's country; and on Mr. Fraser dispatching a man to the quarter indicated, those labelled "Rae near Narwar" were brought in.

About this time I forwarded specimens to Major Ousley, who was then making the settlement of Betool, consequently surrounded by Putels of the district, and on his exhibiting the Shells, several of these country gentlemen came forward and informed him, that similar were to be found in several places about the neighbourhood of Betool. The principal sites are Sussoondra to the east; Bhurkawara, Bhyawara, Jaora to the south; Budoree, Kolgaon, Gaekham, Bakore, to the south-west; and Moorkha to the east of Mooltaye.

The next site ascertained was a bluish coloured Fossil Shell of calcedony brought from Narainpoor, situated in the Sobagpoor Pergunnah, north of the Nerbudda, and finally those sent in from Domadadur in the Ramgurh Raja's territory, south of the above river. For a knowledge of the two last sites we are indebted to the assiduity of Mr. Fraser in this most exciting pursuit.

I have also formerly sent specimens that were known to have come from near Mundla: our present circuit of the Agent to the Governor General, has enabled me to ascertain the site from whence they are derived; Phool Saugor, a village nine miles west of Mundla is the locality, in a nulla called by the cognosient Sunkh Deyra, and on a hill close by the Shell Breccia, and Fossil wood were obtained. From this place the only Bivalves (four in number) have been procured; two of which I forwarded to the Asiatic Society, and the remainder are in Mr. Fraser's collection.

Accompanying this notice, I send natural sized drawings (for which I am indebted to my friend Captain P. A. Reynolds, of the Madras Army,) of all the varieties we have now discovered.

- No. 1. Specimen of a Shell from Dhoonra.
2. From Phool Saugor, near Mundla. Those from Sussoondra, Gyekham, Bhurkawara, in the Betool district, are identically the same species.
3. From Narrainpoor, remarkable for the great breadth of the third whirl. Those from Rae Scindea's country and Domadadur in Ramgurh are similar.

4. From Moorkha, east of Mooltaye.
5. 5. 5. Three varieties found in the Breccia from Phool Saugor, near Mundla.
6. The only specimen of the kind from Sussoondra, east of Betool.
7. Shell (imbedded in Breccia of the same kind) from Jaora, south of Betool. This and the two next specimens are not reversed, as all the others are.
8. 8. Two specimens from Phool Saugor, near Mundla, identical with No. 7 from Betool district.
9. 9. Two drawings to shew how curiously one Shell is imbedded in the other. These are two very beautiful specimens, but the pencil cannot give any idea of the crystals at A A which add so much to their appearance.
10. Is delineated to give some notion of the very remarkable shape into which the shell has been compressed. Many brought in are almost flat, some have an indentation exactly corresponding to another Shell, but without any appearance of fracture or fissure, so that at the time of the convulsion it must have been in a plastic state.

So ends my notes on Fossil Shells, chiefly found in the Saugor and Nerbudda territories, for the discovery of which, after my geological friend the lime-burner, we are indebted to the zeal and activity of Messrs. Fraser, Ousley, and Ommaaney.

The next communication will be on the dispatch of Fossils, that our late travels on the Nerbudda have produced, and for which you will be indebted to the above gentlemen, aided by their Secretary.

GEORGE G. SPILSBURY.

Camp, Source of the Nerbudda,
15th March, 1838.

*Supplementary Note on five additional varieties of Fossil Shells found in the Saugor and Nerbudda Territories.**

- A. A drawing of a Shell totally unlike any of the others, and as yet only found at one site. Its great difference consists in the ribs or furrows so plainly shown in the specimen; this kind was found in March, 1838, on the 1st plateau of the

* Indeed the whole set, with exception of those from Rae, are so.

Mekul range of Hills, at the top of a steep trap ghat, on the high road from Sohagpoor to Umurkuntuk, near a village called Pureye;—the whole ground for some two miles was strewn with Shell Breccia.

- B. This is a drawing of a Shell also found at the same site, and is not a reversed Shell. This, and the specimens No. 7 and 8. 8. found at Mundla, and also Betool, are the only Shells whose whirls are twined as those of the present day are.
- C. D. Bivalves found at Phool Saugor and Mundla, and only a very few specimens have as yet been brought in. One similar was sent in from Mohtura Hill, (a branch I suspect of the Mekul Hills,) in the Ramgurh Rajah's country, where the Domadar ones are found.
- E. Also a Bivalve, great numbers of which have lately been found in the Nerbudda near Jhansee Ghât, a fossil field which Mr. Fraser, the Agent of the Governor General, has brought to light, and of which I shall have more to say on forwarding some notes on fossils and sites from Hoshingabad to this.
- F. Another Bivalve intermixed with E., but as yet only a few have been brought in.

On referring to the plates of the Himalayan Fossil Shells attached to the Rev. R. Everest's paper in the xviii. vol. of the Society's Transactions, the only Bivalve bearing any resemblance to those under notice is Fig. 13, Plate 1st. described as undetermined, which in general character has much the appearance of some found at Mundla, but ours are reversed. Plate 2nd. Bivalves, Fig. 26, b. the supposed *Unis* comes very near our F.—all the others are totally distinct.

The whole of the drawings are of the natural size, and I am indebted to the able pencil of Captain P. A. Reynolds, of the Madras Service, for their delineation.

JUBULPOOR,
11th October, 1839.

ART. V.—*Note on the River Goomtee, with a section of its bed.*—By
V. TREGGAR, ESQ. *Jounpore.*

The accompanying section of the River Goomtee was taken about 20 miles (in a direct line) from its mouth, abreast of the village of Mye, at a time when the slowness and shallowness of the stream rendered the work one of neither labour nor difficulty. The depths were taken at every three feet, in a horizontal line perpendicular to the direction of the current, which runs here nearly due East. The rate on the 4th March last was one mile and 640 yards per hour—on the 13th June it was three miles an hour, and this latter I think the average velocity during the rains;—it is however sometimes much greater, probably nearly five miles, but at others much less, and occasionally when the Ganges rises much and suddenly, there is no current at all.

I have marked the highest level in ordinary seasons, but it sometimes rises considerably higher;—last year it overflowed both banks to some distance, destroying parts of many villages and overthrowing a number of houses in the city of *Jounpore*;—there, the road at the north end of the bridge was passable only by means of boats, and a large lake was formed between the city and the cantonments. No one remembers its having ever been so high; but it is somewhere said, that a fleet of boats once sailed *over* the bridge; the natives hereabouts have no tradition of so extraordinary an inundation, which, if it really happened, must have caused much destruction;—in fact, I think it questionable, whether the bridge could withstand the pressure to which it must have been subjected upwards and sideways, after the arches became insufficient for the passage of the water.

The water, although in appearance extremely muddy, contains but little silt, the quantity from a large portion being exceeding small in bulk, and not likely to weigh, when dry, more than a few grains.*

This river is navigable by the largest boats from about the end of June to the end of November, and by those of smaller size to *Jounpore*, and some distance beyond it; during the rest of the year also small boats, not too heavily laden, can I believe go up beyond *Lukhnaw*, but the passage is, except in the height of the rains, a most tedious one, the distance by water being about three times that by land, for the river deserves its name of Goomtee, or winding. The traffic upwards

* Eighteen ounces by measure, gave seven grains only.

consists of stone-slabs and sugar mills from Chunar—saul wood from Gorukhpore, and grain of all kinds from the latter place and Bengal ;—downwards are sent sugar, and the indigo of numerous factories about Jounpore.

I send for the Museum* some fragments of glazed earthenware, found on a slightly elevated spot in this neighbourhood. Forty years ago the place was covered with dense jungle, and large burr and peepul trees—sufficient grounds for believing the absence of human habitations for a very long period. The Hindoos have been denied the knowledge of the art of porcelain manufacture and glazing, and I am not aware of specimens like these having elsewhere been found. As a Hindoo can use earthen vessels but once, it is most probable that a Moosulman village once stood where these pieces are found, and very likely the art came with those for whose service such vessels would be employed. It is, however, strange that the art should have been lost, for I believe it is no where known to the natives. The fragments are of a coarse fabric and rude workmanship, but the glaze is good, and the colours very bright, considering the time they have been exposed—probably two or three hundred years ;—the blue is very bright, and seems to have been the favourite colour—the designs are not very elegant, and evidently neither Chinese nor imitations of it.

Agates and pebbles, cut and uncut, are also found, having been used I imagine in the composition of the glaze; or it may be for beads only, numbers of which are picked up. They must have been brought from a distance, as no stream producing them is to be seen on this side the Ganges, the nearest hills being opposite Benares. Could the common clay now used have been employed for the body of the ware? I fancy not, for it vitrifies and swells at a low heat, losing its shape, and adhering to whatever it touches. It is a great pity the art is lost.

V. T.

* Many will doubtless laugh to see them there. I was surprised, when a boy, to see in the British Museum pieces of broken glass vessels, neither handsome nor well made; but it was explained to me, that such things were valuable as specimens of the manufacture in its early days, and not according to their price as mere glass.

ART. VI.—*Memoranda relative to experiments on the communication of Telegraphic Signals by induced Electricity.*—By W. B. O'SHAUGHNESSY, M. D. Assistant Surgeon ; Professor of Chemistry, Medical College, Calcutta ; and Officiating Joint-Secretary to the Asiatic Society of Bengal.

There are few projects which at first sight appear so visionary as those which promise practical benefit to mankind through the agency of electrical operations. From the dawning of knowledge in this science, pretenders of every grade have found it a free field for their speculations: and hence perhaps it arises that the sober and practical part of society generally regard with distrust, the multitudes of projects which electricians are constantly advancing.

We nevertheless find that many eminent philosophers—whose habits of cautious research, have been proved by their numerous contributions to the mass of general science—such men as Brande, Faraday, Wheatstone, and Fox—are amongst the foremost, who predict many real advantages to the community from the application of the mysterious, though readily controllable forces which electricity places at our command.

I am aware that I am less entitled than many others to have my inferences from electrical data attended to with confidence, having at least on one occasion fallen into the error of indulging prematurely in dreams of useful results, and of reasoning unguardedly from the model to the machine. Still I believe that the experiments detailed in this paper, will be found to admit fairly of the consequences to which they seem to me to lead. They appear to me conclusive as to the perfect practicability of establishing, at a cheap rate telegraphical communications, acting through electrical agencies, certain and infallible in their indications, perceptible alike by night and day, in all varieties of weather and season, and, lastly, so swift in their nature, that the greatest distances concerned bear scarcely any appreciable proportion to the inconceivably brief period in which the signal can be conveyed.

I was induced to institute the experiments detailed in this paper, by the statements I had read in several periodicals regarding similar attempts in England and the continents of Europe and America, and the actual patenting and adoption by the directors of the London and Birmingham railway of a similar plan by Professor Wheatstone, of the King's College, London.

Before entering into details regarding my experiments, which were carried on in the Botanical Gardens of Calcutta, during May of this

year, it will perhaps prove interesting to give a rapid historical outline of the attempts which have been made to apply the various indications of the electrical fluid as the medium of instantaneous communication between distant places. For several of the following references I am indebted to an article by Dr. Steinheils of Munich, translated in the May number of Sturgeon's Annals of Electricity.

HISTORICAL NOTICE.

1.—*Telegraphs by common electricity.*

The first electrical telegraph on record was proposed by Winkler of Leipzig, in 1746. He employed a Leyden jar which was discharged through a single wire, a reach of the river Pleiss being included in the circuit. Le Monnier afterwards made a similar experiment in Paris, using a wire 12,789 feet long. In 1798, Betancourt laid a wire between Madrid and Aranjuez, 26 miles distant, to serve for the transmission of shocks by the Leyden phial. The pith ball electrometer was used by Lomand; and the sparks from tin-foil on glass surfaces by Reiser about the same period.

In 1826, Francis Ronalds, of Hammersmith, published a description of a plan in which two clocks were employed, one at each terminal station. Each clock had a moveable dial with twenty signals on its circumference. As the required signal letter presented itself, a spark passed at each station by the discharge of a Leyden phial. This plan, though comprising, as I will point out in the sequel, the true principle of a good system, was found useless in practice, as each sign was given but once in each revolution.

Such are the principal attempts hitherto made to effect the object in view, by means of frictional electricity. At the Meeting of the Asiatic Society of Bengal, of June 1839, M. Adolphe Bazin presented a project for effecting telegraphic correspondence by means of thirty insulated conductors passing between the terminal stations, each conductor representing a letter or number, so that by the rapid succession of sparks correspondence could be effectually carried on. With this M. Bazin connected an hydraulic apparatus for the conveyance of intelligence across rivers, and in other situations where frictional electricity might not be suitable.

M. Bazin's plans, although very ingenious, were altogether impracticable, and as we shall afterwards establish, demanded thirty conductors, where only one is actually requisite; moreover the impediments to the use of common electricity are absolutely insuperable in all countries (Bengal for example) visited by periodical rains or inundations.

M. Bazin indeed admitted this freely, when he found that not one of the electrical machines I placed at his disposal could by ordinary manipulation be made to evolve the least sign of excitement. But even effecting the excitement, which I have done by enclosing the machines within a glass case hermetically sealed, and supplied with air artificially dried, still it is impossible so to insulate the *external* conductors, as to prevent the dispersion of the excitement outside the apparatus.

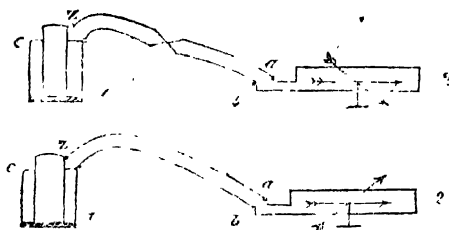
§ 2.—*Telegraphs by Chemical decomposition.*

In Steinheils' historical sketch we find that Soëmmerring, in 1807, employed a voltaic battery provided with thirty-five conductors, each terminating in a gold pin set in a tube; on completing the connexions the water is decomposed and the ascent of bubbles of gas indicates the signal. This system is, however, only available for very short distances, as the decomposing power of the termination of any pair of conductors, the diameter being the same, diminishes rapidly by lengthening the wire. The law of the diminution, Ritchie has attempted to establish, but his experiments are not considered to be conclusive; its rapidity may be shewn by an experiment I performed in 1839. A voltaic battery, the conductors of which were *six* feet long, decomposed water to the rate of forty cubic inches of oxygen and hydrogen gases in three minutes. Conductors of the same diameter, but *thirty-six* feet long were next employed; the battery then only evolved twenty-five cubic inches of the gases; with wires of 200 feet only eleven inches were obtained; still the battery was constant in its action, for with the original conductors at the close of the experiments it still gave forty cubic inches. Again in the experiments at the Botanical Garden in 1839, no chemical decomposition—even of the most yielding of all compounds, the ioduret of potassium—could be performed at the termination of one and a half miles, whereas other manifestations of electrical action were readily procurable at the termination of twenty-one miles of wires.

§ 3.—*Telegraphs by volta-magnetic deflection.*

The next method employed is the deflection of the magnetic needle by voltaic or magnetic electricity. I may remind the general reader that whenever electrical vibrations occur in exceedingly rapid intervals in an insulated wire surrounding and in the same direction with a balanced magnetic needle, the needle is deflected, either east or west according to the order in which the ends of the surrounding coil are

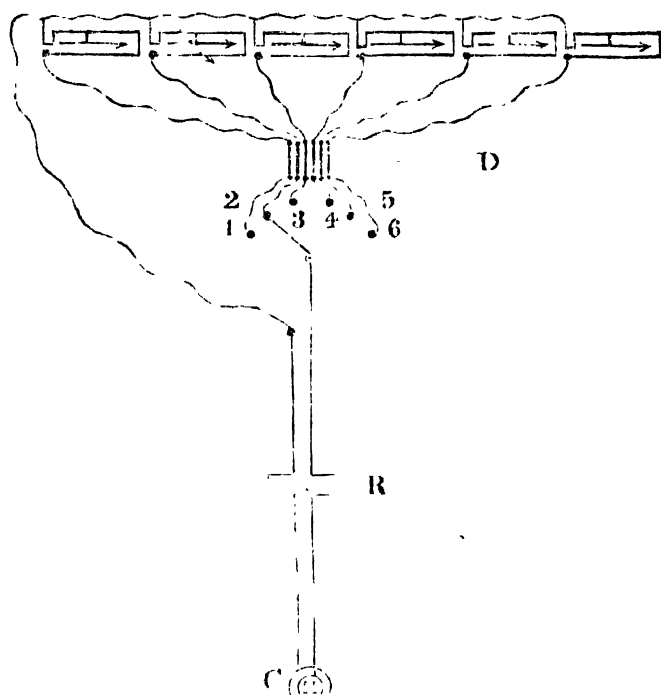
connected with the source of electrical excitement. As I am now writing for popular readers I may be pardoned by the adept for illustrating this interesting fact by an explanatory diagram.



In this diagram, 1 represents the voltaic couple; *z* zinc; and *c* copper; 2 shows the magnetic needle on its stand in the magnetic meridian, with the surrounding coil of wire, with its terminations *a* and *b*. In the first the wires cross, or that from *z* proceeds to *b*, that from *c* to *a*, and the deflection accordingly is from north to west. In the second the wire from *z* proceeds to *a*, that from *c* to *b*, and deflection of the needle is from north to east.

Thus with two wires we can obtain two signals only, but one wire may belong, or be common to any number of galvanometers, so that from three wires we can obtain four signals; from four wires six signals; from five wires eight signals; from six wires ten signals; eight wires fourteen signals; ten wires eighteen signals; twelve wires twenty-two signals; fourteen wires twenty-six signals, or the alphabet.

In the following diagram six galvanometers are represented connected with seven wires, one being common to all. The six wires run any distance in a bundle, and are best insulated by silk or resin from each other. The ends of the wires then proceed to little cisterns of mercury, disposed in a circle. From the centre of the circle a moveable wire proceeds as a radius, which may be moved to any of the cisterns 1, 2, 3, 4, 5, 6. To this centre proceeds one of the poles (*z*) of the voltaic couple—and to the termination of the common wire, proceeds the second pole of the couple *c*.



In the diagram the connexion is made with No. 2, and the dotted line shews the deflection of the needle—and this deflection may be reversed by crossing the course of the battery wires, as shewn at R. The five parallel lines at D shew the conductors, which may be indefinitely prolonged.

Thus by a move of the *radius wire* to any of the cisterns we can deflect the needle at the corresponding galvanometer; and by a move of the cross wires we can reverse the deflection at our pleasure.

We have here a combination which affords sufficient numbers for spelling, numbering, dictionary and cypher signals. Even four galvanometers which can be worked by five wires, will afford the necessary combinations for every description of signals.*

* This telegraph has been actually laid down between London and Drayton, and is to be carried on to Bristol. Though extremely ingenious, I shall presently prove that the railway itself without any special conductors, or at most with one wire, is a perfect telegraphic line.

In Davy's telegraph the needles carry slight screens which conceal illuminated letters or numbers—on deflecting the needle the signal is disclosed.

Soon after the discovery of the deflection of the needle, several attempts were made to establish by its use, the laws of action of the battery. Ritchie attempted to prove that the deflection was in the direct ratio to the surface of zinc acted on in the battery. Thus supposing the conductors unchanged, and that by the corrosion of one superficial inch of zinc a deflection, say of 5° be obtainable, the corrosion of two superficial inches will give a deflection of 10° . Were this assertion supported, a single galvanometer would give us all the signals we could require. It is now however proved that the supposed law by no means holds good. It is quite true that we may double or treble a given deflection, or that we may by direct experiment proportion the voltaic force to the deflection required, but such experiments are only fit for performance in the closet or laboratory,—require such careful adjustment and observation—and are, moreover, so exceedingly delicate, and take so much time in recording, that they become quite unsuitable for the rapid transmission of telegraphic signals.

In the preceding arrangements in which several galvanometers were used, we have manifestly all that we require within the distances to which experiment has yet reached. But the expense of wire next presents itself as a motive for endeavouring to improve the system by diminishing the number of the wires. To render this intelligible, of the copper bell wire best suited for these experiments, each mile costs 276 rupees.

Steinheils of Munich, the most recent writer on this subject, proposes either of two very ingenious methods. The first is causing the galvanometrical needle to terminate in a fountain pen, the tip of which touches and marks a strip of paper revolving by clockwork ;—according to the number of dots a letter or numerical signal can be obtained. The second plan is the employment of the tip of the needle to strike a bell, when the number of strokes in a given time afford the requisite signal.

The galvanometer moreover has been rendered so exceedingly delicate in its indications, that very feeble electrical forces will succeed in producing deflections. The electricity evolved by holding up the hand before a disk composed of bismuth and antimony, caused in an instrument contrived by Dr. Page, of Baltimore, a deviation of fifty degrees. In a galvanometer in my possession, constructed by Messrs. Watkins and Hill, the action of a drop of acidulated water on a zinc wire the size of a pin, and opposed to a copper element of equal size, urges the needle through a quarter of a circle. Moreover the differen-

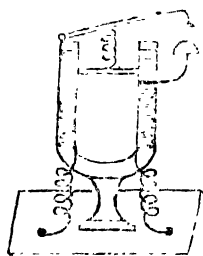
tial principle so successfully applied by Häuy to the discovery of magnetism in minerals containing traces of iron, can be had recourse to here so as to enhance still further the delicacy of these beautiful instruments.

Having thus sufficiently exposed the construction and mode of action of the galvanometer, I must reserve for another place, the results of my experiments in testing the value of the different methods described.

§ 4.—*Henry's Magnetic Telegraph.*

I have still however to notice another proposal which has attracted great attention, and is said, on good authority, to be in course of practical application in the United States.

Professor Henry proposes to employ the sudden development of magnetism, occasioned in a horse shoe bar of soft iron while surrounded by a spiral of insulated wire, the extremities of which are in contact with a voltaic couple. The magnet thus created attracts a light piece of iron which carries an arm. The arm when attracted marks dots on a revolving cylinder, or may strike a bell. The arrangement is shewn in the following figure. The spiral wire in the centre is a spring to lift up the arm on the cessation of each stroke.

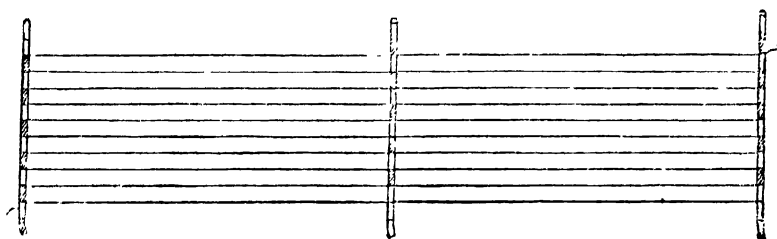


Eleven miles of wire were employed in one of Henry's experiments, but the wire was coiled spirally round a drum, a circumstance which considerably invalidates the results. This will seem sufficiently intelligible by reference to the construction of the "coil electro-magnetic machine," described in a subsequent page.

§ 5.—*Experiments by the Author.*

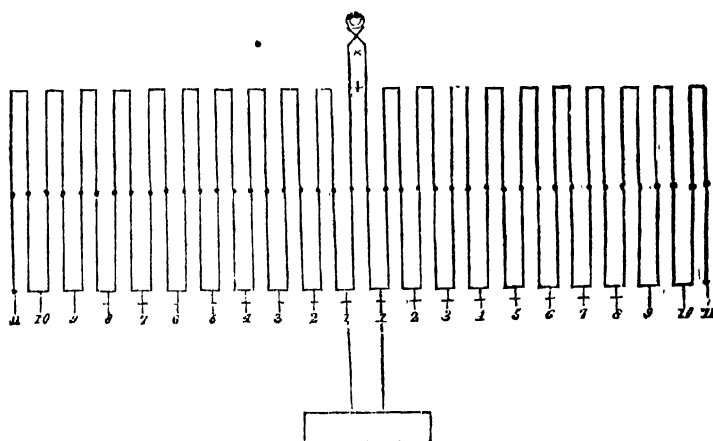
I have now given an adequate sketch of the several methods of communication hitherto proposed, and I proceed to the description of the experiments I have carried on, in the view of testing the comparative merits of the preceding plans and of another, which I have myself devised.

My first object was to construct a line of wires of sufficient length to afford practically valuable results. With Dr. Wallich's liberal aid a parallelogram of ground, 450 feet long by 240 in breadth, was planted with forty-two lines of bamboos. Each line was formed of three bamboos firmly driven into the ground, fifteen feet in height. Each row was disposed so as to receive half a mile of wire in one continuous line, thus,*



The strands of wire were one foot apart from each other. As each row was laid down, it was carefully coated with tar varnish.

A tent was pitched in front of the entire line, and the connections of the wires were so established that in the course of half an hour it could be tested from centre to the extreme flank, so as to ascertain the effects of lengths of wire, varying from one to eleven miles at either side, forming a total circuit of twenty-two miles. This may be perhaps more readily intelligible from the subjoined figure.



* Eleven lines should have been shown in this drawing.

The cross lines above the numbers exhibit the wires led from each half mile of conductor. Thus by cutting through 1. 1. the next numbers to right and left became the conductors or nearest electrodes, and the length of the circuit thus rose from one to three miles; cutting 2. 2. will make 3. 3. the electrodes, and increase the circuit to five miles, and so on, each section added a mile to the circuit at either side.

The wires employed were of iron (annealed), diameter one-twelfth of an inch. It is almost needless to observe that iron was used not from choice but necessity. A sufficient quantity of copper wire was not procurable in Calcutta, no draw-bench was ready to manufacture the necessary supply, moreover the rainy season was fast approaching when such experiments could scarcely be attempted, constant exposure in the open air being essentially requisite to success. The expense again of copper would have amounted to much more than a private individual could afford.

With iron wire however I considered that the results would be still of much practical value. Being the *worst* of the metallic conductors of electricity, it seemed a reasonable inference that whatever might be found practicable with iron, would *à fortiori* be so with the copper, or best conductor.

On the completion of the line the following instruments were tried.

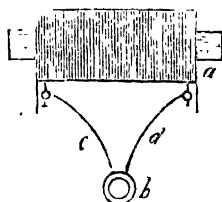
1st. An electro-magnet of soft iron, $1\frac{1}{2}$ inch in diameter, poles 1 inch apart, length from centre to poles 12 inches, weight 14 lbs. surrounded by one hundred yards of insulated copper wire, the twelfth of an inch in diameter. This electro-magnet, when excited by the voltaic battery used in the subsequent experiments, with conductors seven feet in length, supported 240lbs.

2nd. An electro-magnet of very small size, constructed by Watkins, of London, capable of supporting 30lbs. with the battery now referred to, and with the same length of conductors.

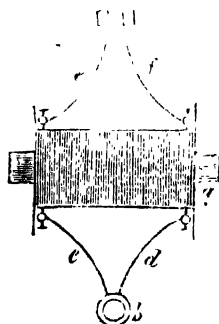
3rd. An astatic galvanometer by Watkins and Hill, already referred to.

4th. An electro-magnetic induction machine, also by Watkins, of which a brief description is desirable.

This instrument consists of a coil of thick wires insulated by silk, and wound spirally round a wooden cylinder having a hollow axis one inch in diameter. The ends of this coil are connected with metallic screws, so that they can be joined to the poles of a voltaic battery.



Around this primary coil is wound a second coil of extremely thin wire, also insulated and 1000 yards long, totally unconnected, though in close juxtaposition with the primary coil, the ends of the wire being led to screws to which handles, directors, &c., can be attached. thus.



Into the hollow axis at *a* is introduced a bundle of insulated iron wires.

The action of the instrument may be very briefly described. While the battery at *b* is in contact with the wires *c d* the primary coil is excited. By interrupting the circuit at *+* or elsewhere, at the instant of its interruption, the secondary or external coil becomes excited by induction or proximity—and this excitement is augmented by the influence of the magnetism simultaneously annihilated in the central bundle of iron wire.

The electrical state thus momentarily generated in the secondary wires, may be rendered evident by the production of a spark and shock, by effecting chemical decomposition and all the other signs of electrical action, at the terminations of the secondary coil *e, f*.

In this cursory description I confine myself to facts alone, and refrain from entering on any theoretical speculation as to the causes of these singular and deeply interesting phenomena.

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*Experiments with the Electro-magnet No. 1.*

The day being fine, the ground and bamboos perfectly dry, at 9. A. M. the sustaining power of the electro-magnet No. 1. was tested with iron conducting wires ten feet long, and found to amount to 46 lbs.

With one mile of same wire,  $\frac{1}{2}$  mile at each side,

it supported, . . . . . 18 lbs.

2 Miles of wire, . . . . . 8 lbs. with difficulty.

3 Miles of wire, . . . . .  $2\frac{1}{2}$  lbs.

4 Miles of wire, . . . . . 23 ounces, with difficulty.

$4\frac{1}{2}$  Miles, . . . . . sustaining force ceased altogether.

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Electro-magnet No. 2.

With 10 feet wire, 12 lbs.

— 1 Mile, 7 lbs.

— 2 Miles, 3 lbs.

— 3 Miles, $0\frac{1}{2}$ lb.

— 4 Miles, no sustaining power.

Assuming iron to be inferior to copper in about the proportion of 1 to 7, according to Sir Humphry Davy and Becquerel's standard of conductors, this experiment shews that for equal diameters of wire, copper would convey the signal by Henry's method to about twenty-one miles in an imperceptible period of time. This distance might be extended by enlarging the diameter of the wires, but to what limit, is as yet unknown.

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*Experiments with Galvanometer.*

The astatic galvanometer was arranged and levelled with much care, the needles retaining a very slight degree of directive force so as to cause them to swing in the magnetic meridian.

At 1 Mile, deviation maximum or . . . . .  $90^{\circ}$

The needles being restrained by pins at the quadrant :—

At 2 Miles. . . . .  $90^{\circ}$

— 3 Miles. . . . .  $75^{\circ}$

— 4 Miles. . . . .  $63^{\circ}$

— 6 Miles. . . . .  $40^{\circ}$

— 10 Miles. . . . .  $11^{\circ}$

—  $11\frac{1}{2}$  Miles at each side to total circuit 23 miles. } barely perceptible.

Up to the sixth mile the needles were deflected with great rapidity on the connexion being made with the voltaic element. The reversal of the order of connection also satisfactorily reversed the needle from east to west, and the contrary. But when the deflection fell to below  $40^\circ$ , the movements were exceedingly sluggish, so that on an average two seconds elapsed before each signal could be read off. The change of battery poles then often failed in reversing the direction of the needles—and here, as before, at least two seconds were consumed in each movement. Applying the same rule to this as to the preceding experiment, the galvanometer would convey signals by a copper wire to a distance of twenty-eight miles—and this might be increased by enlarging the wire or the battery, or by adding to the delicacy of the galvanometer—but in one essential point this system was deficient, namely, in rapidity of movement. Two seconds or even *one*, on each telegraphic movement, would be an extravagant waste of time compared with the celerity with which signals can be conveyed by another method.

#### *Chemical decomposition.*

One of the most delicate of all tests of voltaic electrical action is the decomposition of ioduret of potassium and the production of a blue colour which the free iodine strikes with starch. This effect was produced in my experiments for a line of three miles of wire. Beyond this no decomposition could be effected. From this fact we are entitled to infer the impracticability of Soëmmering's method. See § 2.

#### *Induction machine, and mode of correspondence by Pulsations and • Chronometers.*

The battery was connected with the primary coil see fig. 1. p 723. by very short wires;—the ends of the secondary coil wires screwed to the right and left wires of the great parallelogram. P. 721.

On breaking contact with the primary coil, a shock utterly intolerable passed at half a mile to an individual holding the metallic handles in which the wires ended.

To avoid fatiguing details I may at once state, that by this secondary coil, excited by but three small voltaic couples, the shocks up to seven miles were exceedingly smart—at eleven and a half at each side, they amounted to no more than strong, but not disagreeable, sensations. I think these might be best termed “pulsations,” for to the *hand* they impart the same feeling proportionately, that a strong and full pulse does to the *finger*.



Each pulsation is practically simultaneous with the breaking of contact with the battery. To give a rude idea of the velocity of the signal, the contact being broken by a clicking wheel, on a perfectly calm morning, at a distance of but sixty yards, the pulsation was invariably felt at a sensible interval before the click which preceded it was heard. Thus sound travelling at the rate of 1090 feet in one second—to 121 feet in one-ninth of a second, the electrical impulse passes through a total circuit of twenty-two miles, in less than that practically insignificant fraction of time. This however conveys but an erroneous notion of the almost inconceivable velocity of the impulse. Professor Wheatstone has proved that the electrical accumulation of the Leyden phial is discharged and circulates through copper conductors, one fifteenth of an inch in diameter, with greater velocity than the progress of light through the planetary spaces, and in the rate at least of 288,000 miles in a second. Now the discharges of the Leyden bottle and those of induced coil electricity are in the closest circumstances analogous to each other.

Of the pulsations thus transmitted, it is perfectly easy to count six in one second—thus with a little practice any signal number can be made from one to six in one second.

Besides the simple repetition of the pulsations up to nine, beyond which they become indistinct for each signal, there are at least two modes of conveying other sensations by this apparatus. If the connexion between the battery of the primary coil be made and broken by a ratchet-wheel of brass and silver, and the wheel be turned pretty rapidly, a sensation analogous to the ruffle of a drum is so distinct as to render mistake impossible. A third set is obtained by interposing a flat file in the battery circuit, and interrupting this by drawing one wire along the surface of the file; here instead of the ruffle, the feeling is that of a blunt saw drawn lightly across the palms of the observer's hands. It is difficult to express in words the differences in these distinguishing signals, but the practice of a quarter of an hour will make the observer so familiar with them, that he can without the slightest difficulty carry on a communication by numbering or spelling with his distant correspondent. With a tithe of the practice of a pianist or harpist, the most perfect sympathy is practicable between the signalists, and that as fast as the signal can be spelt. In short, with but little less velocity than the articulations of language or the writing of stenographic characters, this silent, but thoroughly intelligible, and still most secret of all correspondence can take place.

It is almost unnecessary for me to remind the reader of the admitted

fact, that the exquisite delicacy of the impressions of the touch transcends, in some respects, the evidence of all the other senses. The eye and ear are liable to distraction by casual sounds or phenomena, while the attentive touch knows no interruption. The eye must close momentarily and thus lose the observance of many rapid phenomena. Dazzled by too vivid lights, and confused by too constant watching, vision soon ceases to be accurate, while the frequent repetition of similar sounds either becomes absolute silence to the ear, or like the murmuring of a rivulet or the humming of insects, gradually narcotizes the observer. Let the experimentalist attempt to count but 200 rapid strokes of a faint bell, and he will at once acknowledge the imperfections of any acoustic method.

Thus with copper conductors equal in diameter to the iron wires I employed, signals by pulsation are proved to be communicable by the method above described, in less than any appreciable period of time, to the distance of 154 miles.

Besides the method of telegraphing by pulsations and other signals recognized by touch alone, there is another of which I have made extensive trial, and which is capable of affording still more accurate and intelligible and equally rapid results.

Without any knowledge of the experiments quoted by Steinheils—many months indeed before the paper by that author was published in England—I attempted, and with success, to effect the transmission of signals by using time-keepers at each terminus, and causing the pulsation to be felt as the hands simultaneously passed a certain number or letter on the dial.

In these experiments I first employed a pair of watches modified for my use by that ingenious artist Mr. Grant, of this city. All the movements were taken out but those connected with the second-hand, and a long lever was so constructed as to check the balance-wheel at pleasure during the recoil. Round the second-hand was placed a card dial laid off with three concentric circles divided each into twenty parts. Omitting vowels and superfluous letters, the alphabet was laid down in each circle so that the hand would during each revolution point to any letter three times; the compartments were moreover numbered on the same principle, so that each figure from one to ten would be pointed to six times in a revolution.

The hand is passing each compartment during three seconds. The observer receives say two pulsations, and is thereby referred to the second circle, and reads the letter or cypher, according as the signal be for spelling or numbering.

Although the watches were of the very cheapest kind, and would not keep time together for more than five minutes, still they were quite sufficient to enable a correspondence to be carried on. Thus a signal seldom lasted longer than three minutes; both watches were then allowed to run to No. 1 or zero, and stopped. To renew correspondence a prolonged roll was communicated. If but one roll, it indicated spelling; if two, numbering. On the roll ceasing, three pulsations at intervals of one second were passed, and at the third the correspondents started their watches.

The pendulum was also tried, and with decided advantage. Two German clocks sufficed to demonstrate the practicability of the system. The striking parts were removed, and also the hour and minute hands and dial.—To the axis of the escapement wheel a needle was attached, carrying a light hand which indicated on a dial the signals above described. The German clocks (which cost but 16 rupees the pair,) in numerous experiments beat together for several hours, and could always be relied on for one hour at least. It is almost needless to add, that by shortening or lengthening the pendulum the rate was readily varied from 40 to 80 seconds for each revolution.

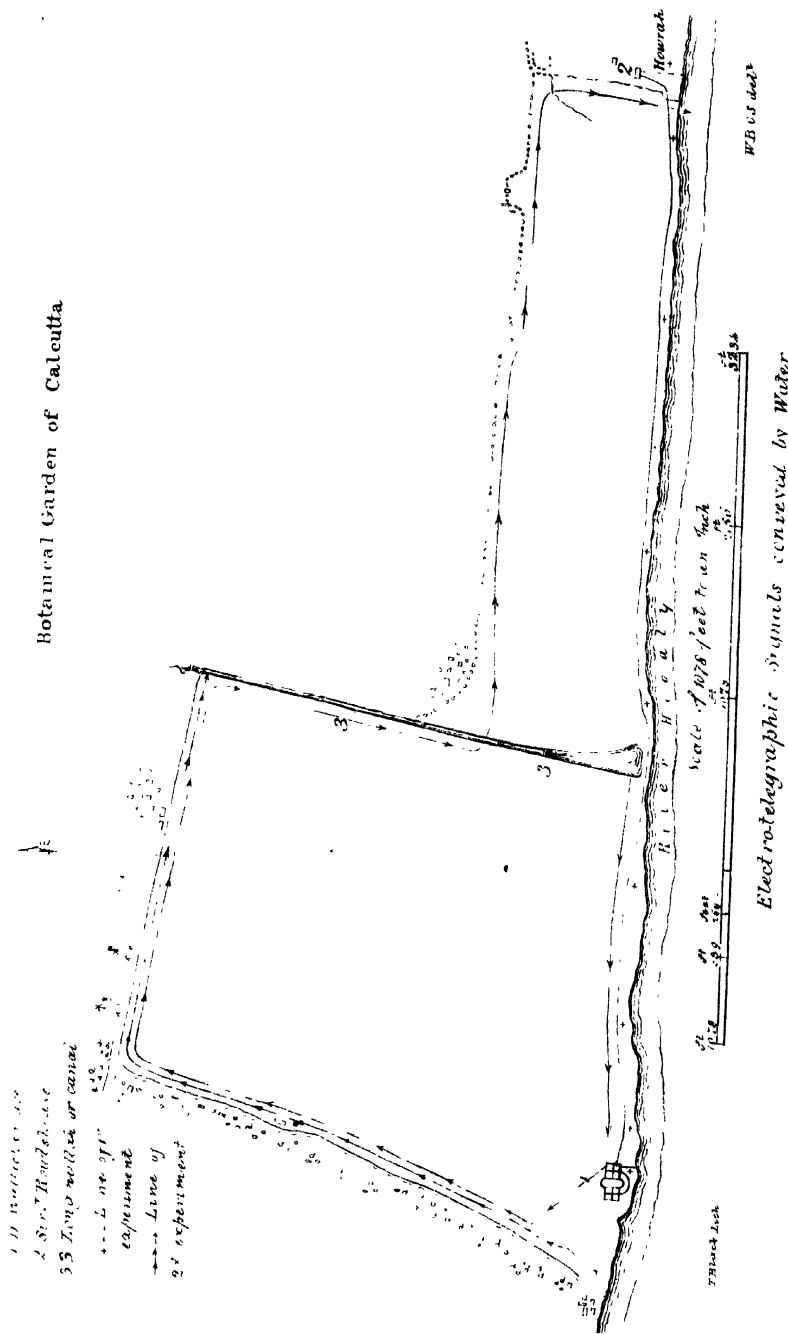
I did not omit chronometers, although I could not of course so alter these costly instruments as to adjust them perfectly to my experiments. It is obvious however that chronometers will on my method give an unerring and constant mode of telegraphic correspondence. In a recent trial at Greenwich the mean error of several instruments in one year was but two seconds!\* Here then are two movers constantly and simultaneously pointing to one and the same signal, be it letter, figure, or cypher. The electric pulsations which “take no note of time” or distance, supply us with the ‘means of converting this synchronism to the unexpected and invaluable end to which it is now proposed to be applied.

Even employing inferior chronometers, the addition of a moveable dial which could be adjusted daily on a method too simple to need description, would secure the perfection of the correspondence; or the daily difference of the instruments being known, a tabular correction could we make; or, lastly, by an occasional astronomical observation of true time at each station, the object in view could be as certainly obtained.

\* In 1831, the first three prize chronometers only differed  $\frac{19}{100}$  of a second in one year.



Botanical Garden of Calcutta



§ 6.—*Water a conductor of Pulsation Signals.*

During the preceding series of experiments, I had ample proof of the great conducting power of water for this form of electrical impulse. Shocks or strange thrilling sensations were perceptible at every step while proceeding through the ground, as long as the morning continued damp. When, however, the sun became sufficiently powerful to dry up the dew, and remove the film of water from the wires, bamboos, and grass, then the wires alone conveyed the electricity. My experiments convince me that dry wood, earth, and masonry are perfect non-conductors of this kind of excitement. Even the bark of living trees seems a perfect insulator.

Some months previous to the experiments now described, I accidentally found too (by the falling of a wire into the large tank at the Medical College) that when water was available, only one insulated wire was requisite for completing communications. I did not omit the opportunity afforded by my experiments at the Gardens of following up this curious result, and although I find the fact has also attracted the attention of Professors Henry and Steinheils, these philosophers will, I feel convinced, learn with interest the simultaneous pursuit of the like object, in my humble investigations.

In one experiment the electro-magnetic machine was stationed at the ghât of Bishop's College, and one of its wires, but twenty-five feet long, dipped in the Hooghly at the ghât. The second wire ran along the dry path round through the Botanic Gardens, and terminated in Dr. Wallich's library. A wire led from the river at the ghât before Dr. Wallich's house, also into the library. The assistant stationed at the machine was directed to make the signals in the usual manner. Every signal told in the library without any notable diminution of effect.

It made no perceptible difference whether the tide was ebbing or flowing ;—in several trials the damp mud even conveyed the signal unaltered in force or character.

The distance by water in the above experiment was 7,000 feet. In a second set of trials the machine was placed at Sir John Royd's garden, the water distance intervening being 9,700 feet, and with the same results as before. (*See lithographed plan No. 1.*)

In a third trial, seven miles of wire were disposed round the trees of the Garden, taking in its entire boundary—starting from Dr. Wallich's house and terminating in the river at Howrah ; a second wire was carried from the river, at the west end of the Garden (two miles

of the Hooghly being interposed) and proceeded to the north extremity of a nullah 3,000 feet in length; from the south end of the nullah a wire returned to the library. Thus we had altogether eleven miles of metallic and 13,256 feet of water circuit, the latter in two interruptions. The signal still passed as intelligibly and strongly as before. A lithographic plan is annexed in illustration of these details.

§ 7.—*General remarks on the applicability of the preceding facts.*

I reserve for another occasion the description of several experiments which these facts led to, regarding the possibility of dispensing altogether with metallic conductors; and I now proceed to shew some practical circumstances, expenses, and other details regarding the application of these facts to the actual accomplishment of telegraphic correspondence.

To effect a perfect system of telegraphic communication for a distance, say of 500 miles, two wires are at most required; where a river passes between the termini, but one wire is necessary. If the water communication be the sea, the distance for which one wire will suffice will be at least quadrupled. Insulation of one wire is necessary. The wire may touch dry substances of any kind, but it must not come in contact with water or damp earth communicating with the second wire or with the river course.

Insulation according to my experiments is best accomplished by enclosing the wire (previously pitched) in a split ratan, and then paying the ratan round with tarred yarn—or the wire may, as in some experiments recently made by Colonel Pasley in Chatham, be surrounded by strands of tarred rope, and this by pitched yarn.

An insulated rope of this kind may be spread along a wet field, nay, even led through a river, and will still conduct without any appreciable loss the electrical signals above described.

In establishing a communication it would be advisable to bury the wire about two feet below the surface of the ground, in a narrow trench well rammed with pounded brick and mortar. At every ten miles the wire should rise through the ground in a masonry pillar, to allow of verification or of the discovery of the situation of accident. In India the Police Thannah houses might be conveniently used for this purpose.

The expense of copper wire per mile would be 272 rupees; of insulation 20; of trenching and masonry I can form no accurate estimate.

As no intermediate stations would be required, the expenses of establishment would be very trivial.

The cost of a magneto-electric machine of the maximum power would not exceed 20*l*. The galvanic apparatus, constructed on the principle I described in 1837, would not at most cost 10*l*. and would probably cost 5*l*. per month for its constant support.

In Europe or America there exists no difficulty whatever to the adoption of this system of correspondence. In India unquestionably the obstacles are greater. Perhaps, however, on the other hand the very wildness of our jungle tracts would rather protect than endanger the buried wire. If properly laid down, in a few months none but those instructed, could find it. But wherever a railroad exists, there this method can be at once adopted. Indeed its applicability is so certain and infallible, its principles so simple, that I often wonder it has not been previously employed or even announced, and that the justly celebrated Mr. Wheatstone should have taken out a patent for a five-wired telegraph when every railroad in England already gives the required conductors.

The progress of science is hourly adding to the catalogue of triumphs effected by the sagacity of man over the seeming impossibilities of nature. Our own day has witnessed the miracle of gas illumination—the discovery of precious metals in potashes and in common salt—the extrication of the electric spark through the influence of magnetism—the solidification of carbonic acid—the fixing by the sun's light of the pictures it forms whether by shadow, reflection, or refraction. A conquest still greater than all which I have quoted would be the annihilation of time and space in the accomplishment of correspondence. That a signal can be passed between places 1,000 miles apart in less time than the motion of solar light through the firmament, is no less startling to assert than it is demonstrably and practically true.

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ART. VII.—*Extract from a Memoir on the Preparations of the Indian Hemp, or Gunjah, (Cannabis Indica) their effects on the Animal system in Health, and their utility in the Treatment of Tetanus and other Convulsive Diseases.*—By W. B. O'SHAUGHNESSY, M. D. *Professor in the Medical College of Calcutta, &c. &c.\**

The narcotic effects of Hemp are popularly known in the south of Africa, South America, Turkey, Egypt, Asia Minor, India, and the adjacent territories of the Malays, Burmese, and Siamese. In all these countries Hemp is used in various forms, by the dissipated and depraved, as the ready agent of a pleasing intoxication. In the popular medicine of these nations, we find it extensively employed for a multitude of affections. But in western Europe its use either as a stimulant or as a remedy, is equally unknown. With the exception of the trial, as a frolic, of the Egyptian "Hasheesh," by a few youths in Marseilles, and of the clinical use of the wine of Hemp by Hahneman, as shewn in a subsequent extract, I have been unable to trace any notice of the employment of this drug in Europe.

Much difference of opinion exists on the question, whether the Hemp so abundant in Europe, even in high northern latitudes, is identical in specific characters with the Hemp of Asia Minor and India. The extraordinary symptoms produced by the latter depend on a resinous secretion with which it abounds, and which seems totally absent in the European kind. The closest physical resemblance or even identity exists between both plants—difference of climate seems to me more than sufficient to account for the absence of the resinous

\* Read before the Medical and Physical Society of Calcutta, on the 2d October, 1839.

We have extracted from this paper the sections relative to the popular uses and the effects on the animal system of these singular and valuable narcotics—for the professional details of cases, which we considered unsuited to our pages, we have to refer the reader to the *Transactions of the Medical and Physical Society*, current volume, fasciculus, for November, 1839.—EDS.





secretion, and consequent want of narcotic power in that indigenous in colder countries.

In the subsequent article I first endeavour to present an adequate view of what has been recorded of the early history, the popular uses, and employment in medicine of this powerful and valuable substance ; I then proceed to notice several experiments which I have instituted on animals, with the view to ascertain its effects on the healthy system ; and, lastly, I submit an abstract of the clinical details of the treatment of several patients afflicted with hydrophobia, tetanus, and other convulsive disorders, in which a preparation of Hemp was employed with results, which seem to me to warrant our anticipating from its more extensive and impartial use no inconsiderable addition to the resources of the physician.

In the historical and statistical department of the subject, I owe my cordial thanks for most valuable assistance to the distinguished traveller the Syed Keramut Ali, Mootawulee of the Hooghly Imambarrah, and also to the Hakim Mirza Abdul Razes of Teheran, who have furnished me with interesting details regarding the consumption of Hemp in Candahar, Cabul, and the countries between the Indus and Herat. The Pandit Moodoosudun Gooptu has favoured me with notices of the statements regarding Hemp in the early Sanserit authors on *Materia Medica* ;—to the celebrated Kamalakantha Vidyalanka, the Pandit of the Asiatic Society, I have also to record my acknowledgments ;—Mr. DaCosta has obligingly supplied me with copious notes from the ‘*Mukzun-ul-Udwieh*’ and other Persian and Hindee systems of *Materia Medica*. For information relative to the varieties of the drug, and its consumption in Bengal, Mr. McCann, the Deputy Superintendent of Police, deserves my thanks ;—and, lastly, to Dr. Goodeve, to Mr. Richard O’Shaughnessy, to the late Dr. Bain, to Mr. O’Brien of the Native Hospital, and Nobinchunder Mitter, Sub-Assistant Surgeon, I feel deeply indebted for the clinical details with which they have enriched the subject.

## SECTION I.

*Botanical characters—Chemical Properties—Production.*

**BOTANICAL DESCRIPTION.**—Assuming with Lindley and other eminent writers that the *Cannabis sativa* and *Indica* are identical, we find that the plant is diœcious, annual, about three feet high, covered over with a fine pubescence; the stem is erect, branched, bright green, angular; leaves, alternate or opposite, on long weak petioles; digitate, scabrous, with linear, lanceolate, sharply serrated leaflets, tapering into a long smooth entire point; stipules subulate; clusters of flowers axillary with subulate bractes; males lax and drooping, branched and leafless at base; females erect, simple and leafy at the base. ♂ Calyx downy, five parted, imbricated. Stamens five; anthers large and pendulous. ♀ Calyx covered with brown glands. Ovary roundish with pendulous ovule, and two long filiform glandular stigmas; achenium ovate, one seeded.—*v. Lindley's Flora Medica*, p. 299.\*

The fibres of the stems are long and extremely tenacious, so as to afford the best tissue for cordage, thus constituting the material for one of the most important branches of European manufactures.

The seed is simply albuminous and oily, and is devoid of all narcotic properties.

**CHEMICAL PROPERTIES.**—In certain seasons and in warm countries a resinous juice exudes and concretes on the leaves, slender stems, and flowers;—the mode of removing this juice will be subsequently detailed. Separated and in masses it constitutes the *Churrus*† of Nipal and Hindostan, and to this the type, or basis of all the Hemp preparations, are the powers of these drugs attributable.

The resin of the Hemp is very soluble in alcohol and ether; partially soluble in alkaline; insoluble in acid solutions; when pure, of a blackish grey colour; hard at 90°; softens at higher temperatures, and fuses readily;—soluble in the fixed and in several volatile oils. Its

\* The drawing which illustrates this paper has been copied by my accomplished friend Dr. George Wallich, from Roxburgh's unpublished plate.

† For very fine specimens of *Churrus*, I have to express my thanks to Dr. Campbell, late assistant Resident at Nipal.

odour is fragrant and narcotic; taste slightly warm, bitterish, and acrid.

The dried Hemp plant which has flowered and *from which the resin has not been removed* is called *Gunjah*. It sells for twelve annas to one rupee the seer, in the Calcutta bazars, and yields to alcohol twenty per 100 of resinous extract, composed of the resin (*churrus*), and green colouring matter (*chlorophylle*). Distilled with a large quantity of water, traces of essential oil pass over, and the distilled liquor has the powerful narcotic odour of the plant. The *Gunjah* is sold for smoking chiefly. The bundles of *Gunjah* are about two feet long and three inches in diameter, and contain twenty-four plants. The colour is dusky green—the odour agreeably narcotic—the whole plant resinous and adhesive to the touch.

The larger leaves and capsules without the stalks, are called "*Bang, Subjee* or *Sidhee*." They are used for making an intoxicating drink, for smoking, and in the conserve or confection termed *Majoon*. *Bang* is cheaper than *Gunjah*, and though less powerful, is sold at such a low price that for one pice enough can be purchased to intoxicate an "experienced" person.

According to Mr. McCann's notes, the *Gunjah* consumed in Bengal is chiefly brought from Mirzapúr and Ghazee pore, being extensively cultivated near Gwalior and in Tirhoot. The natives cut the plant when in flower, allow it to dry for three days, and then lay it in bundles averaging one seer weight each, which are distributed to the licensed dealers. The best kinds are brought from Gwalior and Bhurt pore, and it is also cultivated, of good quality, in a few gardens round Calcutta. In Jessore, I am informed, the drug is produced of excellent quality, and to a very considerable extent of cultivation.

In Central India and the Saugor territory and in Nipal, *Churrus* is collected during the hot season in the following singular manner. Men clad in leathern dresses run through the Hemp-fields brushing through the plant with all possible violence; the soft resin adheres to the leather, and is subsequently scraped off and kneaded into balls, which sell from five to six rupees the seer. A still finer kind, the *Momeea* or waxen *Churrus*, is collected by the hand in Nipal, and sells for nearly double the price of the ordinary kind. In Nipal, Dr. McKinnon informs me, the leathern attire is dispensed with, and the resin is gathered on

the skins of naked coolies. In Persia, it is stated by Mirza Abdul Razes that the *Churrus* is prepared by pressing the resinous plant on coarse cloths, and then scraping it from these and melting it in a pot with a little warm water. He considers the *Churrus* of Herat as the best and most powerful of all the varieties of the drug.

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## SECTION II.

### *Popular uses.*

The preparations of Hemp are used for the purpose of intoxication as follows.

*Sidhee*, *Suljee*, and *Bang* (synonymous) are used with water as a drink, which is thus prepared. About three tola weight, 540 troy grains, are well washed with cold water, then rubbed to powder, mixed with black pepper, cucumber and melon seeds, sugar, half a pint of milk, and an equal quantity of water. This is considered sufficient to intoxicate an habituated person. Half the quantity is enough for a novice. This composition is chiefly used by the Mahomedans of the better classes.

Another recipe is as follows. \*

The same quantity of *Sulhee* is washed and ground, mixed with black pepper, and a quart of cold water added. This is drank at one sitting. This is the favorite beverage of the Hindus who practice this vice, especially the Birjobassies and many of the Rajpootana soldiery.

From either of these beverages intoxication will ensue in half an hour. Almost invariably the inebriation is of the most cheerful kind, causing the person to sing and dance, to eat food with great relish, and to seek aphrodisiac enjoyments. In persons of a quarrelsome disposition it occasions, as might be expected, an exasperation of their natural tendency. The intoxication lasts about three hours, when sleep supervenes. No nausea or sickness of stomach succeeds, nor are the bowels at all affected; next day there is slight giddiness and vascularity of the eyes, but no other symptom worth recording.

*Gunjah* is used for smoking alone—one rupee weight, 180 grains, and a little dried tobacco are rubbed together in the palm of the hand with a few drops of water. This suffices for three persons. A little

tobacco is placed in the pipe first, then a layer of the prepared *Gunjah*, then more tobacco, and the fire above all.

Four or five persons usually join in this debauch. The hookah is passed round, and each person takes a single draught. Intoxication ensues almost instantly; and from one draught to the unaccustomed, within half an hour; and after four or five inspirations to those more practised in the vice. The effects differ from those occasioned by the *Sidhee*. Heaviness, laziness, and agreeable reveries ensue, but the person can be readily roused, and is able to discharge routine occupations, such as pulling the punkah, waiting at table, &c.

The *Majoon*, or Hemp confection, is a compound of sugar, butter, flour, milk, and *Sidhee* or *Bang*. The process has been repeatedly performed before me by Ameer, the proprietor of a celebrated place of resort for Hemp devotees in Calcutta, and who is considered the best artist in his profession. Four ounces of *Sidhee* and an equal quantity of *Ghee* are placed in an earthen or well-tinned vessel, a pint of water added, and the whole warmed over a charcoal fire. The mixture is constantly stirred until the water all boils away, which is known by the crackling noise of the melted butter on the sides of the vessel; the mixture is then removed from the fire, squeezed through cloth while hot—by which an ~~o~~maginous solution of the active principles and colouring matter of the Hemp is obtained—and the leaves, fibres, &c., remaining on the cloth are thrown away.

The green oily solution soon concretes into a buttery mass, and is then well washed by the hand with soft water so long as the water becomes coloured. The colouring matter and an extractive substance are thus removed, and a very pale green mass, of the consistence of simple ointment, remains. The washings are thrown away;—Ameer says that these are intoxicating, and produce constriction of the throat, great pain, and very disagreeable and dangerous symptoms.

The operator then takes two pounds of sugar, and adding a little water places it in a pipkin over the fire. When the sugar dissolves and froths, two ounces of milk are added; a thick scum rises and is removed—more milk and a little water are added from time to time, and the boiling continued about an hour, the solution being carefully stirred until it becomes an adhesive clear syrup, ready to solidify on a cold surface; four ounces of tyre (new milk dried before the sun) in fine powder are



now stirred in, and lastly the prepared butter of Hemp is introduced, brisk stirring being continued for a few minutes. A few drops of uttur of roses are then quickly sprinkled in, and the mixture poured from the pipkin on a flat cold dish or slab. The mass concretes immediately into a thin cake, which is divided into small lozenge-shaped pieces. A seer thus prepared sells for four rupees: one drachm by weight will intoxicate a beginner; three drachms one experienced in its use. The taste is sweet, and the odour very agreeable.

Ameer states that there are seven or eight *Majoon* makers in Calcutta;—that sometimes by special order of customers he introduces stramonium seeds, but never nux-vomica;—that all classes of persons, including the lower Portuguese or “Kala Feringhees,” and especially their females, consume the drug;—that it is most fascinating in its effects, producing extatic happiness, a persuasion of high rank, a sensation of flying, voracious appetite, and intense aphrodisiac desire. He denies that its continued use leads to madness, impotence, or to the numerous evil consequences described by the Arabic and Persian physicians. Although I disbelieve Ameer’s statements on this point, his description of the immediate effects of *Majoon* is strictly and accurately correct.

Most carnivorous animals eat it greedily, and very soon experience its narcotic effects, becoming ludicrously drunk, but seldom suffering any worse consequences.

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### SECTION III.

#### *Historical details—Notices of Hemp, and its popular uses, by the Sanscrit, Arabic, and Persian writers.*

The preceding notice suffices to explain the subsequent historical and medicinal details. I premise the historical, in order to shew the exact state of our knowledge of the subject, when I attempted its investigation.

Although the most eminent of the Arabic and Persian authors concur in referring the origin of the practice of Hemp intoxication to the natives of Hindoostan, it is remarkable that few traces can be detected of the prevalence of the vice at any early period in India.

The Pandit Moodoosudun Gooptu finds that the "*Rajniguntu*," a standard treatise on *Materia Medica*, which he estimates vaguely at 600 years date, gives a clear account of this agent. Its synonymes are "*Bijoya*," "*Ujoya*," and "*Joya*,"—names which mean, promoters of success; "*Brijputta*," or the strengthener, or the strong-leaved; "*Chapola*," the causer of a reeling gait; "*Ununda*," or the laughter-moving; "*Hursini*," the exciter of sexual desire. Its effects on man are described as excitant, heating, astringent. It is added that it "destroys phlegm, expels flatulence, induces costiveness, sharpens the memory, increases eloquence, excites the appetite, and acts as a general tonic."

The "*Rajbulubha*," a Sanscrit treatise of rather later date, alludes to the use of Hemp in gonorrhœa, and repeats the statements of the "*Rajniguntu*." In the Hindu Tantra, or a religious treatise, teaching peculiar and mystical formulæ and rites for the worship of the deities, it is said, moreover, that *Sidhee* is more intoxicating than wine.

In the celebrated "*Susruta*," which is perhaps the most ancient of all Hindu medical works, it is written, that persons labouring under catarrh should, with other remedies, use internally the *Bijoya* or *Sidhee*. The effects however are not described.

The learned Kamalakantha Vidyalanka has traced a notice of Hemp in the 5th chapter of *Menu*, where Brahmins are prohibited to use the following substances, *Palandoo* or onions, *Gunjara* or *Gunjah*, and such condiments as have strong and pungent scents.

The Arabic and Persian writers are however far more voluminous and precise in their accounts of these fascinating preparations. In the 1st vol. of De Sacy's "*Crestomathie Arabe*" we find an extremely interesting summary of the writings of Takim Eddin Makrizi on this subject. Lane has noticed it too with his usual ability in his admirable work "*the Modern Egyptians*." From these two sources, the MS. notes of the Syed Keramut Ali and Mr. DaCosta, and a curious paper communicated by our friend Mirza Abdul Razas, a most intelligent Persian physician, the following epitome is compiled.

Makrizi treats of the Hemp in his glowing description of the celebrated Canton de la Timbaliere, or ancient pleasure grounds, in the vicinity of Cairo. This quarter, after many vicissitudes, is now a heap of ruins. In it was situated a cultivated valley named Djoneina, which we are informed was the theatre of all conceivable abomina-

tions. It was famous above all for the sale of the *Hasheeha*, which is still greedily consumed by the dregs of the populace, and from the consumption of which sprung the excesses which led to the name of "Assassin" being given to the Saracens in the Holy Wars. The history of the drug the author treats of thus:—The oldest work in which Hemp is noticed is a treatise by Hasan, who states that in the year 658, M. E. the Sheikh Djafar Shirazi, a monk of the order of Haider, learned from his master the history of the discovery of Hemp. Haider, the chief of ascetics and self-chasteners, lived in rigid privation on a mountain between Nishabor and Ramah, where he established a monastery of Fakirs. Ten years he had spent in this retreat without leaving it for a moment, till one burning summer's day when he departed alone to the fields. On his return an air of joy and gaiety was imprinted on his countenance; he received the visits of his brethren and encouraged their conversation. On being questioned, he stated that struck by the aspect of a plant which danced in the heat as if with joy, while all the rest of the vegetable creation was torpid, he had gathered and eaten of its leaves. He led his companions to the spot,—all ate and all were similarly excited. A tincture of the Hemp leaf in wine or spirit seems to have been the favorite formula in which the Sheikh Haider indulged himself. An Arab poet sings of Haider's *emerald cup*—an evident allusion to the rich green colour of the tincture of the drug. The Sheikh survived the discovery ten years, and subsisted chiefly on this herb, and on his death his disciples by his desire planted it in an arbour about his tomb.

From this saintly sepulchre the knowledge of the effects of Hemp is stated to have spread into Khorasan. In Chaldea it was unknown until 728 M. E. during the reign of the Khalif Mostansir Billah: the kings of Ormus and Bahrein then introduced it into Chaldea, Syria, Egypt, and Turkey. \*

In Khorasan however, it seems that the date of the use of Hemp is considered to be far prior to Haider's era. Biraslan, an Indian pilgrim, the contemporary of Cosröes,\* is believed to have introduced and

\* By this term is probably meant the first of the Sassanian dynasty, to whom the epithet "of Khusrow" or Cosröes, equivalent to Káiser, Cæsar, or Czar, has been applied in many generations. This dynasty endured from A. D. 202 to A. D. 636—*vide* note 50 to Lane's translation of the *Arabian Nights*, vol. ii. p. 226.

diffused the custom through Khorasan and Yemen. In proof of the great antiquity of the practice, certain passages in the works of Hippocrates may be cited, in which some of its properties are clearly described—but the difficulty of deciding whether the passages be spurious or genuine, renders the fact of little value. Dioscorides (lib. ij. cap. 169,) describes Hemp, but merely notices the emollient properties of its seeds—its intoxicating effects must consequently be regarded as unknown to the Greeks prior to his era, which is generally agreed to be about the second century of the Christian epoch, and somewhat subsequent to the lifetime of Pliny.

In the narrative of Makrizi we also learn that oxymel and acids are the most powerful antidotes to the effects of this narcotic; next to these, emetics, cold bathing, and sleep; and we are further told that it possesses diuretic, astringent, and especially aphrodisiac properties. Ibn Beitar was the first to record its tendency to produce mental derangement, and he even states that it occasionally proves fatal.

In 780 M. E. very severe ordinances were passed in Egypt against the practice: the Djoneina garden was rooted up, and all those convicted of the use of the drug were subjected to the extraction of their teeth; but in 799 the custom re-established itself with more than original vigour. Makrizi draws an expressive picture of the evils this vice then inflicted on its votaries—"As its consequence, general corruption of sentiments and manners ensued, modesty disappeared, every base and evil passion was openly indulged in, and nobility of external form alone remained to these infatuated beings."

#### SECTION IV.

#### *Medicinal properties assigned to Hemp by the ancient Arabian and Persian writers, and by modern European authors.*

In the preceding notice of Makrizi's writings on this subject we have confined ourselves chiefly to historical details, excluding descriptions of supposed medicinal effects. The Mukzun-ul-Udwieh and the Persian MS. in our possession, inform us as to the properties which the ancient physicians attributed to this powerful narcotic.

In Mr. DaCosta's MS. version of the chapter on Hemp in the *Mukzun-ul-Udwieh*, *Churru*, we are informed, if smoked through a pipe causes torpor and intoxication, and often proves fatal to the smoker. Three kinds are noticed, the *garden*, *wild*, and *mountain*, of which the last is deemed the strongest;—the seeds are called *sheadana* or *shaldaneh* in Persia. These are said to be “a compound of opposite qualities, cold and dry in the third degree, that is to say, stimulant and sedative, imparting at first a gentle reviving heat, and then a considerable refrigerant effect.”

The contrary qualities of the plant, its stimulant and sedative effects, are prominently dwelt on. “They at first exhilarate the spirits, cause cheerfulness, give colour to the complexion, bring on intoxication, excite the imagination into the most rapturous ideas, produce thirst, increase appetite, excite concupiscence. Afterwards the sedative effects begin to preside, the spirits sink, the vision darkens and weakens; and madness, melancholy, fearfulness, dropsy, and such like distempers, are the sequel—and the seminal secretions dry up. These effects are increased by sweets, and combated by acids.”

The author of the *Mukzun-ul-Udwieh* further informs us—

“The leaves make a good snuff for detarging the brain; the juice of the leaves applied to the head as a wash, removes dandriff and vermin: drops of the juice thrown into the ear allay pain and destroy worms or insects. It checks diarrhœa, is useful in gonorrhœa, restrains seminal secretions, and is diuretic. The bark has a similar effect.”

“The powder is recommended as an external application to fresh wounds and sores, and for causing granulations; a poultice of the boiled root and leaves for discussing inflammations, and cure of erysipelas, and for allaying neuralgic pains. The dried leaves bruised and spread on a castor oil leaf cure hydrocele and swelled testes. The *dose* internally is one *direm*, or 48 grains. The antidotes are emetics, cow's milk, hot water, and sorrel wine.”

Alluding to its popular uses, the author dwells on the eventual evil consequences of the indulgence;—weakness of the digestive organs first ensues, followed by flatulency, indigestion, swelling of the limbs and face, change of complexion, diminution of sexual vigor, loss of teeth, heaviness, cowardice, depraved and wicked ideas, scepticism in religi-

ous tenets ;—licentiousness and ungodliness are also enumerated in the catalogue of deplorable results.

The medicinal properties of Hemp, in various forms, are the subject of some interesting notes by Mirza Abdul Razes. “ It produces a ravenous appetite and constipation, arrests the secretions except that of the liver, excites wild imagining, especially a sensation of ascending, forgetfulness of all that happens during its use, and such mental exaltation, that *the beholders attribute it to supernatural inspiration.*”

Mirza Abdul considers Hemp to be a powerful exciter of the flow of bile, and relates cases of its efficacy in restoring appetite—of its utility as an external application as a poultice with milk, in relieving hæmorrhoids—and internally in gonorrhœa to the extent of a quarter drachm of *bangh*. He states also that the habitual smokers of *Gunjah* generally die of diseases of the lungs, dropsy, and anasarca—“ so do the eaters of *Majoon* and smokers of *Sidhee*, but at a later period. The inexperienced on first taking it are often senseless for a day, some go mad, others are known to die.”

In the 35th chapter of the 5th volume of Rumphius' *Herbarium Amboinense*, p. 208, Ed. Amsterd. A. D. 1695, we find a long and very good account of this drug, illustrated by two excellent plates. The subjoined is an epitome of Rumphius' article.

Rumphius first describes botanically the male and female Hemp plants, of which he gives two admirable drawings. He assigns the upper provinces of India as its *habitat*, and states it to be cultivated in Java and Amboyna. He then notices very briefly the exciting effects ascribed to the leaf, and to mixtures thereof with spices, camphor, and opium. He alludes doubtingly to its alleged aphrodisiac powers, and states that the kind of mental excitement it produces depends on the temperament of the consumer. He quotes a passage from Galen, lib. i. (de aliment, facult) in which it is asserted that in that great writer's time it was customary to give Hemp seed to the guests at banquets as promoters of hilarity and enjoyment. Rumphius adds, that the Mahomedans in his neighbourhood frequently sought for the male plant from his garden to be given to persons afflicted with virulent gonorrhœa and with asthma, or the affection which is popularly called “stitches in the side.” He tells us, moreover, that the powdered

leaves check diarrhoea, are stomachic, cure the malady named *pitao*, and moderate excessive secretion of bile. He mentions the use of Hemp smoke as an enema in strangulated hernia, and of the leaves as an antidote to poisoning by orpiment. Lastly, he notices in the two subsequent chapters varieties of Hemp which he terms the *Gunjah sativa* and *Gunjah agrestis*. In the *Hortus Malabaricus* Rheedes' article on the Hemp is a mere outline of Rumphius' statements.

Among modern European writers the only information I could trace on the medicinal use of Hemp in Europe, is in the recent work of Ness v. Esenbeck, from which the following is an extract kindly supplied by Dr. Wallich:—

“The fresh herb of the Hemp has a very powerful and unpleasant narcotic smell, and is used in the East in combination with opium, in the preparation of intoxicating potions, &c. It is probable that the *nepenthe* of the ancients was prepared from the leaves of this plant. Many physicians, Hahnemann among them, prescribe the vinous extract in various nervous disorders, where opium and hyoscyamus used to be employed, being less heating and devoid of bitterness.”\*

No information as to the medicinal effects of Hemp exists in the standard works on *Materia Medica*, to which I have access. Soubeiran, Féé, Merat, and de Lens in their admirable dictionary; Chevalier and Richard, Roques (*Phytographie Medicale*); Ratier and Henry (*Pharmacopée Française*); and the *Dictionnaire des Sciences Medicales*—are all equally silent on the subject.

In *Ainslie's Materia Indica*, 2nd vol. we find three notices of the plant and its preparations.

At page 39 “Banghie,” (*Tamul*) with the Persian and Hindee synonyms of “Béng” and “Subjee,” is described as an intoxicating liquor prepared with the leaves of the *Gunjah*, or Hemp plant.

Under the head *Gunjah*, Ainslie gives numerous synonymes, and tells that the leaves are sometimes prescribed in cases of diarrhoea; and in conjunction with turmeric, onions, and warm gingilie oil are made into an unction for painful protruded piles. Dr. Ainslie also gives a brief view of the popular uses and botanical peculiarities of the plant.

\* *Handbuch der Medicin. und Pharmac. Botanik, von F. Ness von Esenbeck et Dr. Carl Ebermaier. vol. 1, p. 338*

*Majoon*, lastly, is described by Dr. Ainslie, page 176, as a preparation of sugar, milk, ghee, poppy seeds, flowers of the datura, powder of nux-vomica, and sugar. The true *Majoon* however as prepared in Bengal contains neither datura nor nux-vomica. I have already described the process by which it has been manufactured before me.

In the *Journal de Pharmacie*, the most complete Magazine in existence on all pharmaceutical subjects, we find Hemp noticed in several volumes. In the *Bulletin de Pharmacie* t. v. a. 1810, p. 400, we find it briefly described by M. Rouyer, apothecary to Napoleon, and member of the Egyptian scientific commission, in a paper on the popular remedies of Egypt. With the leaves and tops, he tells us, collected before ripening, the Egyptians prepare a conserve, which serves as the base of the *berch*, the *diasmouk*, and the *bernaouy*. Hemp leaves reduced to powder and incorporated with honey or stirred with water constitute the *berch* of the poor classes.

The same work also, (*Bulletin*, vol. i. p. 523, a. 1809,) contains a very brief notice on the intoxicating preparations of Hemp, read by M. De Sacy before the Institute of France in July, 1809. M. De Sacy's subsequent analysis of Makrizi, of which I have given an outline, is however much more rich in details than the article in the *Bulletin*.

(*To be continued.*)

ART. VII.—*Memoir on the Climate, Soil, Produce and Husbandry of Afghanistan and the Neighbouring Countries.*—By Lieut. IRWIN.

It gives us great pleasure to be the means of rescuing from undeserved oblivion, the admirable Memoir on Afghanistan, of which we now present to our readers the first part. The author (then) Lieut. IRWIN accompanied Mr. ELPHINSTONE in his Mission to Cabul, and is honorably mentioned in the preface to Mr. E's justly celebrated work. The Memoir we now publish exists in the Library of the Asiatic Society, and was first brought to our notice by Captain CUNNINGHAM of the Bengal Engineers. Subsequently Dr. SPRY struck by the value of its details on rural economy, proposed its publication to the Agri-



cultural Society. We were unwilling to concede even to that most useful public body, the honor of discharging a duty we felt to be peculiarly our own; our readers will doubtless be gratified at our thus enriching our pages.

In the next number we hope to communicate some information regarding the accomplished author; who, we understand is now a resident in Van Dieman's Land.—Eds.

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### *Plan and Division of the Memoir.*

The first 47 paragraphs compose an Introduction which treats of the natural division of the countries under view, their chief ranges of mountains and rivers. I here assign the extent in which I understand the various names for countries, provinces, and districts; without this precaution the matter which follows would have been obscure or prolix, perhaps both. This is divided into four parts. The first part treats of Climate, and is divided into four sections, in which are discussed in their order, the temperature, the winds, the rains, and the salubrity. The second part treats of the Soil, and has no division. The third part treats of Natural History, and is divided into three sections;—in the first, are mentioned the mines and mineral products of these kingdoms; in the second, the most remarkable vegetables; in the third, the animals and carriage. In this part of the memoir some matter has found a place which will scarcely be reckoned interesting in a public view, but which was naturally introduced from the desire of completing the plan originally proposed. The fourth part is an attempt to give some idea of the husbandry. The second, which I entitle “a review of the districts,” details what are the chief occupations and means of subsistence, the chief live stock and kinds of grain, the plenty or scarcity of supplies, and some particulars of a miscellaneous nature; it concludes with an estimate of the population.

The following is a briefer sketch of the contents of this memoir:

Introduction,

I. Climate.—1 Temperature,—2 Winds,—3 Rains,—4 Salubrity.

II. Soil.

III. Natural History.—1 Minerals,—2 Vegetables,—3 Animals.

IV. Husbandry and Cultivation.—1 Husbandry,—2 Review of the Districts.

*Of the Climate, Soil, Products, and Husbandry of Afghanistan and  
the Neighbouring Countries.*

In the following pages I treat of a wide extent of country, being nearly the whole of the space of which a map has lately been constructed by Lieut. Macartney. In a more particular manner will be treated Afghanistan, which is central in it. Such is the extent and diversity of this last country alone, that were our attention confined to it, still could a brief treatise contain but cursory notices even of the important parts of a subject so extensive; much more must it be so, when the neighbouring tracts are to be in some measure included in the survey. With respect to the accuracy also of the matter here offered, although it be hoped that there is a considerable preponderance of truth, it must be supposed that in the circumstances under which it has been collected and digested, the errors too must be numerous.

2. Afghanistan is bounded on the north by mountains which divide it from Kashkar and Budukhshan; other mountains divide it on the north-west from that part of Toorkistan which lies on this side of the Oxus, and that part of Khoorasan which extends north nearly to that river; on the west it includes a part of that famous geographical division; while beyond in this direction is the Persian Khoorasan; to the south it has deserts and Bulochistan. The Indus from its exit from the lofty mountains in about the latitude of  $45^{\circ}$  N. sometimes constitutes its eastern boundary, and sometimes is comprehended in it, as will be in the sequel more fully explained. Discarding the provinces of Sindh and Kushmeer, as if parts of India, and also the provinces lately belonging to the monarchy in the south-east of Toorkistan, with the contiguous ones in the north-east of Khoorasan, the Afghan people and government may be considered as included within the 35th and 29th degrees of north latitude and the 62nd and 73rd of east longitude.

3. Without discussing the nature of the political connection between Bulochistan and the Afghan monarchy, it seems sufficient for us that there is a practical convenience in naming and considering them separately. Bulochistan, so called from two nations called Bulochis, who compose the bulk of its population, has Afghanistan to the north, a desert dividing it in that quarter from Seestan, (Seestan on the whole lies north-west of Bulochistan); to the west, deserts or very ill-peopled tracts divide it from the Persian province Kirman; to the south is the sea; and to the east Sindh. The government of Sindh

possesses the port of Kirachee, which may be considered as locally within Bulochistan. The country is thus included within the 25th and 31st degrees of north latitude, and the 60th and 70th of east longitude.

4. We have already seen that Afghanistan embraces a part of Khoorasan, an ancient geographical division which has been recognized downwards from the earliest times, not merely in books but in common conversation, and that with little variation, notwithstanding the frequent changes of dominion and even of population in the country. We are not concerned with its southern or western boundaries. To the east it extends in one point to Mookr, and in that neighbourhood may be considered as ending where considerable heights begin; it thus includes the whole of the Dooranee country. Seestan too is but a division of it. In more northern latitudes its extent is more difficult to fix. The western part of the Paraparnisan range of hills with the valleys contained and the neighbouring plains—forming together the country of the Ymaks—both was and is considered as part of Khoorasan; but the eastern part of the same tract which the Huzaras possess may more properly be stiled a broad boundary between it and Hindoostan, in its largest sense, which includes Cabul and even Ghuznee. Still more to the north Khoorasan in ancient times extended to the confines of Budukhshan, thus including My-muna, Undkho, Bulkh, Koonduz, Khoollum, Ghoree, and Talikan. Perhaps Budukhshan itself, and whatever lies on the left of the Punj or Upper Oxus, was formerly part of Khoorasan, while the country on the right was coarsely distinguished as that lying beyond the river (Mawaroolnahr.) But the usage of modern times is contrary to such an extension of the term, and restricts Khoorasan in this quarter nearly by the river Marghab. In Asia rivers seldom form boundaries, but rather are themselves considered as included in certain countries on both their banks, and thus Khoorasan may be allowed to comprehend a certain distance to its right, especially during its upper course. From where that stream empties itself into the Oxus, the Oxus is perhaps for a certain distance the boundary of Toorkistan to the north and Khoorasan to the south. In truth both banks of that great river, but especially the left, are here so barren, that limits are little regarded or understood. Towards the mouth of the river, Toorkistan extends considerably to the left of it, unless we consider Khwaruzm as distinct from either division.

5. The term Toorkistan in its present sense is but modern, and liable to some ambiguity. It may be said to contain the following provinces—

1st, The ancient Khwaruzm, lying towards the mouth of the Oxus chiefly, if not entirely to its left, and the Toorkman deserts extending from it towards the Caspian. 2nd, The tract we have just excluded from the modern Khoorasan, but not including Budukhshan. The natives having no appropriate name for it, I propose to distinguish it by its ancient one of Bactria. 3rd, The tract lying between the Oxus and Jaxartes, with a small territory beyond the latter river. 4th, The country beyond the Jaxartes inhabited by the Kuzzkas to the west and Kirghizes to the east;—tribes but little advanced in society, or acquainted with agriculture. Beyond them to the north we come to the Russian dominions, and on the east the Chinese. A fifth tract to be called Chinese Toorkistan, and not to be included under the term of Toorkistan simply, is to be afterwards mentioned. These general terms will in the sequel be less used than others more particularly applicable to countries of far inferior extent; but preparatory to the enumeration of these, let us sketch the course of the mountains and hills, which chiefly mark out their boundaries and give them their character.

6. The first and greatest ridge is that which forms the boundary to the north of Afghanistan. It originates however near the right of the Burmhpootr river, and running thence in a westerly and northerly direction, forms a boundary of the plains of Hindoostan and the Punjab, which are watered by the streams that either originate in it or the lofty lands beyond it. Within it is contained the fertile valley of Kushmeer, and beyond Kushmeer it forms the lofty tract called Little Tibet, and bounds to the north Pukhlee, into which it seems to send a branch. Crossing the Indus it has no longer the same tendency to the north of west, but running in nearly  $35^{\circ} 25'$  north latitude separates Bhooner, Swad, and Punjkora, small districts now occupied by the Yoosufzyes, and into which its branches extend from Kashkar to the north. Arrived at the river commonly called from this last country, as originating in it, its greatest ridge appears to stretch in a direction to the south of west to a termination in the mountain Hindookoosh, but one minor ridge is detached along the left of the Kashkar river, which it divides from Bajaur to the Punjkora, while others on the right of that river form in their course the cragged country of the Kafeis, (but the Kafeis have some other portions of those mountains, and overhang the low valley of Lughuran. This grand chain has as a whole no acknowledged name among the natives, nor have the European authors yet agreed in one denomination to be given it. It is undoubtedly very lofty, not merely in its central ridge but in most of its lateral branches;

towards Afghanistan this height is usually gained very rapidly, so that not unfrequently low and hot valleys and plains lie at the foot of mountains white with perennial snow.

7. In the opposite quarter they do not preserve one character; Hindookoosh has a rapid descent into Budukhshan, which it divides from the valley of Cabul; more to the east there issues from the great northern ridge another, by geographers named Belur, a term corrupted from the Toorkee word Beloot, signifying a cloud, and which runs perhaps due north and divides Budukhshan, Durwaz, and Kuralegin on the west, from Kashkar on the east. Into all those countries, and beyond them into Toorkistan between the Oxus and Jaxartes, it sends branches generally of considerable height; but according to Lieut. Macartney it cannot be considered as extending beyond the river Jaxartes, which rises in its northern extremity not far from the farthest sources of the Oxus. The Kashkar river too seems to originate in the same neighbourhood but to the east of this range, along the foot of which it generally runs, and by which it is prevented running westwards towards the Caspian. To the left chiefly, or to the east of this river, is the country of Kashkar, which has on the south the great northern chain, so called as lying to the north of Afghanistan. This chain has here a moderate descent, and Kashkar appears to be generally speaking an high plain, which is as it were, supported by it. Many points however remain very obscure. Lieut. Macartney is of opinion that this high plain of Kashkar is surmounted to the north or north-east by another chain of mountains nearly parallel to the first, and in which originate, or partly originate, the Indus and the Kashkar river; and that these mountains in their north-western extremity join the northern extremity of the Belur chain. With respect to this other range which meets the Belur, it seems rather a slight height of land than a lofty ridge, and there is no absurdity in supposing it lower than the ridge first mentioned, though the streams generated in it pierce that ridge. In short, it seems probable that the table land is continued from Tibet as well as the mountains, and this table land naturally has a ridge from which the waters are turned contrary ways, but which need not be supposed lofty above its base. Certain it is that after entering Kashkar travellers from Peshawur to Yarkund, whose course is not very different from due north, have no very high mountains to pass. It is true Kashkar is not destitute of other mountains besides those bounding it to the south and west, but they do not appear to give a character to the country. The north-west part of this table land which lies north of

Kashkar is remarkable for its uniformity and levelness. It is named Pamer, which in the Toorkee of Yarkund signifies "the plain." It appears to be drained west, and probably into the Jaxartes chiefly. The road to Yarkund extends across it for about 60 miles or less, but in length it is said to be double. It is bounded to the south-west by the mountains above Keerategin, and to the north-west by those near the heads of the Jaxartes. Both are of the Belur chain, which is in fact to be considered as the steep termination of that broad upland tract which extends from the longitude of 69° to that of 93° east.

8. In this view of the subject Hindookoosh would be considered as a branch sent from this broad tract still further west. This lofty mountain has also its inferior branches spreading in many directions. A very considerable branch appears to extend from the Belur where in its greatest height it gives source to the Oxus and Jaxartes, and proceeding first west and afterwards south-west, separates Keerategin, Wukheeka, and Durwuz, which are drained into the upper Oxus, from Kohun and other places drained into the Jaxartes, as also from some part of the middle of Toorkistan, the waters of which hold their course to the Oxus in its inferior progress. I presume that all the hills of Toorkistan between those great rivers are to be traced to the Belur. That inferior range only called Aktaw, and which lies between Samarkand and the Jaxartes, seems distinct and insulated. With respect to the hills in the Kuzzak and Kirghiz countries beyond the Jaxartes, I know not what is their exact situation or direction. The former people indeed inhabit a tract generally level on the right of the lower Jaxartes. The Kirghizes pasture the Pamer, but have lower and more hilly grounds to the north-west. Geographers mention under the name of Alak, a range which joins to the Belur and continues in the same direction, that is towards the north, dividing the great and little Bucharas of some authors, here called independent and Chinese Toorkistan. Between Hokun, a city to the left of the Jaxartes in its upper course, and Yarkund in Chinese Toorkistan, one route at least leads over a high mountain, and in the latter country all the waters run to easterly instead of westerly points. The Alak range contains some of the sources of the Jaxartes, and in a higher latitude is said to originate the Neelum which, like the Jaxartes, runs to a westerly point. On the other side arises the Kizlsoo, or river of Kashghur and Yarkund, which, however, seems to be fed also from the grand tract of uplands already mentioned to the south, and from a chain of mountains far to the north, which geographers lay down from east to west and call the Altaian chain. Their latitude may be supposed to be 46°,

and that of Yarkund being by Lieutenant Macartney's construction  $40^{\circ} 30'$ , the medium breadth of Chinese Toorkistan will be at least 400 English miles. Beyond the Altaian chain the waters run north into Siberia and the Frozen ocean. All those of Chinese Toorkistan are lost in itself or in the country immediately to the east (which is also subject to China); to this quarter alone does it slope, while in all others it is bounded by land much higher. Thus false is the common opinion of its forming part of what has been called the table land of Asia; the climate alone is sufficient to convince us of the contrary. Though in a higher latitude than any part of Tibet, the climate is much warmer, a fact we need not be surprized at, since we are informed by merchants who have travelled through great Tibet from Kishmeer to Yarkund that at a certain distance beyond Ludakh begins a descent to Yarkund.

9. There prevails in Europe, or did prevail, an opinion that the Caucasian mountains extend uninterruptedly on the south of Geelan and Mazunduran, and through Khoorasan to a junction with the Hindookoosh. It is highly probable the continuity is not broken until we reach a certain distance into the last country, but afterwards we find for a considerable distance only detached hills, seldom of very considerable altitude; or if there be any chain, or chain of hillocks dividing the rain water and the spring torrents, giving source to no rivers. To treat such as a continuation of Caucasus and Hindookoosh is a manifest abuse of terms. It is moreover aiming at a simplicity of arrangement which is excessive, and tends to darken the subject, not to elucidate it; for by such modes of reasoning ranges might be easily traced from any point, and all the hills and mountains of a continent proved to form parts of one range or of its branches. When generalizations so forced are made, nothing can be affirmed or denied of the whole which shall not be untrue of a considerable number of the facts; and recourse must at length be had to sub-divisions of moderate comprehension, which alone conduce to brevity, perspicuity, and the easy development of facts.

10. There even occur cases where though a connection must be allowed to exist, such is the dissimilarity of character in mountains, that they cannot conveniently be made to pass under one name, or treated of except separately; such is that of a chain which though it have no connection with Caucasus, has an undoubted one with Hindookoosh. We have seen that this famous mountain lies nearly due north of Cabul; but in a west or north-west direction from the valley, the roads to Toorkistan lead over a mountain which the natives

frequently call by the same name, and which is undoubtedly connected with it. The course of the mountains thus appears to change from west to south-west, and thence to almost due south, giving rise in that quarter to the Helbund, the greatest river of Khoorasan. The future course of the central and chief ridge it is difficult to ascertain with much minuteness, but its general course seems to be almost due west to the longitude of Hirat. The branches are numerous and extend to considerable distances, being visible from Candahar, and approaching still nearer to Mimuna, Undkho, and Bulkh in the northern directions. These are the mountains which the ancients seem generally to have distinguished by the name Paraparnisan. I say generally, because doubtless quotations might be brought forward in which the term is applied to others. Disregarding such instances, I propose to restrict the term to this range. The Paraparnisan is not so lofty as the great northern chain. Except the mountain called Shadean, from a village of that name at its foot in the environs of Bulkh, I know no well-ascertained instance of continued snow on any one of them, though it is possible several such exist. They also rise more gradually from their bases than the other chain. Their abruptest descent seems towards Bactria. At their commencement, where they form the tract inhabited by the Gavee Huzaras, they have on the east a gradual descent to the high valley of Cabul, but towards Bactria so rapid, that we soon arrive at climates considerably warmer than Cabul. The table land of Ghuznee, still more elevated than Cabul, bounds to the east the main body of the Paraparnisan which gradually rise from it; to the south-west and north-west the descent into Khoorasan is also in general gradual.

11. Within Afghanistan we have first to notice that range which runs for the most part in latitude 34°. It is difficult to name with much accuracy its commencement to the west. The road from Cabul to south-west passes over no hill; to the eastward, however, of that line we find the valley of Cabul divided from the country to the south by the low ridge of Logur, which still more to the east rises into lofty mountains; these continue to the Indus, holding their course somewhat to the south of east. They even cross the Indus into the district of Attoc and divide (though not accurately) Chhuchh from the Khatirs. Even the hill of Husunubdal from its position and its composition almost seems a detached part of this range, which is of various altitude from the hills of the Khuttuks, seldom sprinkled with snow, to the white mountain, south of Jellalabad, ever crowned with it. The greatest altitude is about the middle, the least to the



east in this range, which is far narrower than the great northern one, is generally much lower, and supports no considerable table land; one corner it is true of the table land of Ghuznee rests on it. From this quarter (the west) the acclivity is gradual, but in most others it is rapid. The white mountain high in itself, appears still higher from its vicinity to the low lands of Jellalabad, whence it rapidly rises. The eastern hills also though so much inferior in height are usually steep, and not easily practicable. The valleys within this range are in general narrow. From its southern side, and east of Jellalabad, it sends off one or more branches to the north-east, in the direction of Swad. This minor range which though low is difficult, forms the boundary to the north-west part of the valley of Peshawur, and all the roads leading thence to Cabul pass through it; where it unites with the great range, it is called Khybur, and the constant inhabitants are chiefly of the Upper Mihmund tribe. To the north-east, in its further progress, succeeds the Ootman-Khel tribe, and here seems to be the greatest height.

12. None of its other branches deserve notice except what may be called the salt range, which proceeds from its southern side in nearly the longitude where commences the preceding, and holds a course to the south-east. At its junction it is inhabited by the Oorukzyes. At a short distance further it forms the country of Upper Bungush, and afterwards continues to Kalabagh on the Indus, and beyond that river to the vicinity of Pind-Dadun Khan, on the right of the Vehut. Its greatest height is at its commencement, but even there it is not very great. In some places it is easily practicable, in others not.

13. Another range runs nearly parallel to that of  $34^{\circ}$  in the medium latitude of  $32\frac{1}{2}^{\circ}$ . Eastward it may be said to begin at the Pezoo pass, and westward it seems to end near Mookr. It supports the south-east corner of the table land of Ghuznee, and in that quarter is of gradual acclivity and a tame character, although the absolute height be considerable. To the east it is more rugged. In height this range on the whole yield to that of  $34^{\circ}$ , for it contains no mountain which bears snow throughout the summer; the eastern part however does not diminish to that lowness which the eastern part does of the range of  $34^{\circ}$ . I know of no considerable height it sends off, but we are not to forget that short range which appears to unite its western extremity with that of the range of  $34^{\circ}$ . It is the eastern buttress of the table land of Ghuznee to which it has a gradual declivity, while to the east it descends with the utmost abruptness, forming a very difficult country, in which live some tribes who quite set at naught the royal authority;

the Jadrans are the chief, and from them those mountains may with propriety be named. They are of a height on the whole not superior to the range of  $32\frac{1}{2}^{\circ}$ , unless the lofty mountain Bunseekun be considered as part of them. It lies towards their northern extremity, and is covered with perpetual snow. The longitude of the Jadran range is, by Lieut. Macartney's calculation, about  $69\frac{1}{2}^{\circ}$ .

14. The southern part of Afghanistan is in all things far more obscure to us than the northern, but chiefly we are ill informed respecting the conformation of the country. It is neither well peopled nor much civilized, nor frequently traversed. It appears to be neither mountainous nor plain, but diversified with numerous small and tame-featured hills. Such a country is naturally in a warm climate but little productive. It certainly contains no mountain on which the snow does not melt before midsummer. The highest is the famous Tukhti Soolleman, called by the Afghans Kuseghur, which rising boldly from the low plain, right of the Indus, appears to the stranger a most conspicuous object, but is certainly far less elevated than the white mountain. From it proceeds a range of mountains in a direction parallel to the Indus, even somewhat beyond the most southern limits of Afghanistan. Their height is but moderate. I know not whether we can trace hills proceeding northwards from the Tukhti Soolleman and bounding Mukulwad and the Daman to the west, or whether the hills which appear from Dera Ismael Khan in that quarter be merely the ends of ridges running east and west, and among others of that of  $32\frac{1}{2}^{\circ}$ . Somewhat more to the north, however, begin some hills which extend for about 30 miles nearly parallel to the Indus, ending at the right bank of the Koorm. Those hills form a double range, and between is a sandy and barren valley known in the neighbourhood under the name of Largee. It is plainly formed from the ruins of these hills which are low and friable. The most eastern range closely hems in the Indus, and little arable land is left between, yet here live the Khusor tribe of Afghans, while the western range belongs to the Murwuts. The Khusor and Murwut hills are not properly comprehended in the southern Afghanistan, which may be considered as having for its northern boundary the range of  $32\frac{1}{2}^{\circ}$  or the river Gomul, or the 32nd degree of north latitude. The other hills of this tract need be but little expatiated on. The country slopes east towards the Indus, south into Bulochistan, and west into the Afghan Khoorasan, or country of the Dooraneeas, but it is difficult to assign the boundaries of those natural divisions, The western part, inhabited chiefly by the Kakur tribe of Afghans,

is more elevated than the eastern, where live the Sheeranees, Lohanees, Oosturanees, and others, but these hills do not rise to a great height. We need not except even the hill Toba, lying 90 miles to the south-east of Candahar, which is now famous from having been during the last years of Ahmed Shah's life the cool summer retreat of that monarch.

15. Bulochistan is in general a flat and arid country, yet is not destitute of hills. We may trace a low range from near Sihwan, in a direction somewhat to the west of south and parallel to the Indus, almost to the sea-shore. At Sihwan it appears to change its direction, and instead of proceeding north to a junction with the Soolemanee\* range, as represented in former maps, passes north-west, and ends some stage short of Jellalabad of Seestan. On this range is situated Kilat, nearly where it is highest. The mountain called Maran, which lies two days north of that place, is the only one in the range which bears perpetual snow. By this range Seeweestan is separated from that tract to the south-west inhabited by roving tribes of the Rinds in which Kirachee is situated, and the roads are said to be difficult. Towards its termination to the north-west this range seems to connect itself with the hills of the Kakurs; there are other hills in Bulochistan which however seem irreducible to any chain. Kilat and whatever lies west of Seeweestan is commonly reckoned part of the geographical division of Khoorasan. Kirachee is perhaps part of Hindoostan, and Seeweestan certainly is. Sindh is a campaign country. Bhukhur however is situated on a low hill or rock insulated by the Indus, but which must be considered as a prolongation of a low range which runs from the left bank of the river in a south direction diagonally into the desert, ending in the space of 30 miles. Jesulmer in the centre of the Indian desert, is built on an insulated low hill. The country of Kuchh which lies between the desert and the Indian ocean is a hilly one.

16. We have seen that the range of 34° and the salt range cross the Indus into the Doab of the Vehut and Indus. This Doab has also branches from the great northern range which run in directions very far from parallel to the preceding. The most remarkable is that which separates Chhuchh Hazara, the Khatirs, and other districts on the west and north-west, from Pothwar on the east and south-east. Towards the commencement of the range live the Gukhurs, a tribe which has been famous in history. Here is the chief elevation, which is but moderate. This Doab has also solitary hills or small ranges, not clearly derivable from any of the above-mentioned chains. The shape

\* I use the term as our geographers seem to do, the natives employ it seldom, and give it a wider application.

and conformation of the country is thus very irregular, and the natural character of the portions very various. The hills and ranges (if indeed any there be) of Seestan and of all parts of Khoorasan are equally irregularly disposed, and cannot in writing be brought clearly before the mind. Few indeed rise to a considerable height.

17. Having concluded our sketch of the ranges of mountains, we now proceed to enumerate the various natural divisions thus formed and marked out. Some have been already mentioned, Kashkar lies north of the great northern range and east of the Belur; to its east is the country of little Tibet. Both are lofty and cold countries, and both seem to be more plain to the north and more mountainous to the south. The Upper Indus is perhaps the boundary. Little Tibet, or a part of it, is by some called Balteestan, from Baltee a Moosulman tribe inhabiting it, but the majority of the people seem to be in little Tibet of the system of religion known in the great Tibet lying to the east of Kushmeer. Little Tibet and Kashkar are as yet independent of the Emperor of China, who never entered them or sent his troops thither, still less has he ever threatened Budukhsan; but part at least of the Pamer is annexed to the Chinese Toorkistan. This extensive country is formed by the northern slope of the great upland track already mentioned (7, 8.) and by the tracts to the north as far as the Altaian chain (8.). Its eastern boundary is unascertained, and probably very uncertain, or marked by desert tracts. Although the whole be firmly attached to the Chinese empire, of which it forms the most western province, it is not under one governor, but many, who seem to be dependent only on the court of Pekin. We may distinguish Kashghur and Yarkund in the south-western angle, Aksoo to the NNE., Ela and Toorfan in the NE. and Khootun (which is not a city, but a country containing seven towns) in the centre. The great majority of the people are of the Toork race, and hence I have called it Chinese Toorkistan. To the north, however, are tribes of pasturing Calmucs; and perhaps this vast province contains some part of the Kobee nation, which although its chief seat be to the east, in the wastes called the desert of Kobee or Sham, yet spreads west into Kashkar, and constitutes the chief population on the banks of the Kashkar river. On the course of this river we find four principalities, and in all, the chiefs are of this race; the highest is the most powerful, and extends his dominion to the right of the Indus, and the mountains north of Swad. These particulars are here the less misplaced, that the countries in question have ever been among the obscurest in Asia, and even the latest inquiries have

but little elucidated them. In future they will be but seldom mentioned.

18. We have already seen that the Belur and Alak chains divide the Chinese from the independent Toorkistan, which stretches thence west to the Caspian, and its three natural divisions into Toorkistan; this side the Oxus. Toorkistan, between the Oxus and Jaxartes, has been mentioned. The boundaries of the last division to the north, where it touches the Russian empire, are supposed to be defined by no great river or mountainous chain or other natural line. Geographers name minor ranges of hills in this division, but it is certain the far greater part is occupied by plains. This is still more true of its western than its eastern parts, and the former in consequence is scarcely an agricultural country, while in the latter we find the greater part of the dominions of the civilized state of Tashkund, and part of that of Kokun, but the capital of that principality and the greater part of the dominions lie in the middle division of Toorkistan. The east of this division contains in addition to Kokun, Keerategen, Wukheet a part of Durwaz, and nearly the whole of Hissar, with some other petty states. All these are hilly countries, and with the exception of the last, they may all be called mountainous; the valleys are of various widths, but generally narrow, and the road from one to another difficult. Durwaz is particularly narrow and impracticable; it lies on the Punj or Upper Oxus, and its princes were of a race which claimed descent from Alexander the Great. By late accounts, the living representative has been expelled by the Keerategenees.\* In the west of this middle division we find Shuhr Subz, an inconsiderable state, and the dominions of Bokhara, which is the most powerful state in Toorkistan. The mountains of the east enter this tract but diminish in their progress, and at length disappear. The west is therefore an open plain with the exception of the district of Nooruta, in which we find the Akhtan hills. These are of moderate height, although the name would lead us to judge otherwise. The highest of the whole has no snow beyond the middle of April. The extent of the range is not great, and no stream originates in it. The parts of this division of Toorkistan which border on the Aral lake, or sea to the west, are flat, sandy, and uncultivated; and the like is true of the opposite tracts beyond the Jaxartes and of those beyond the Oxus, with the exception of Khwaruzm. This was in ancient times the centre of a powerful kingdom, but now its weight is but small; its

\* Not expelled, but deprived of part of his dominions (December 12th).

foreign dependencies have passed into other hands; the blowing of the sands have submerged part of its territory, and the productiveness of the remainder been lessened by the change artificially made in the course of the river Oxus. Mr. Pinkerton has expressed his scepticism in regard to the fact, and it may well be questioned whether the whole of this river was on that occasion turned; but the learned in the history of Toorkistan assure us that in the — century, the Calmucs did divert a great stream which passed west through the kingdom of Khwaruzm, and made it to run where now runs the Oxus into the lake of Aral. Khwaruzm still has its stream artificially drawn from the Oxus, and which is indispensable to its cultivation and existence. At no great distance from the river commence deserts, which extend to the Caspian, and are traversed by the pasturing tribes of Toorkmans (who moreover possess the sandy banks of the Oxus from Kelif downwards) and some other tribes. The chief city of Khwaruzm is Oorgunj.

19. Bactria, the only remaining part of Toorkistan, lies on the left of the Oxus during its middle course. It is now distinguished into several sub-divisions according to the remarkable cities and the existing distribution of dominion. Beginning from the quarter of Khoorasan, first occurs on this side the Murghab Kuburmach of the Jumsheedees, which tribe however living chiefly on the left of the Murghab for this and other reasons (4) we must assign it to Khoorasan. From Kuburmach proceeding in a direction not much different from ENE. we come at the distance of 30, 56, 20, 24, miles to My-muna, Undkho, Shibirghan, and Bulk, capitals of little states now independent. The traveller has to his right branches of the Paraparnisan, which are generally visible; he pursues his journey in a cultivated or cultivatable country, but beyond it to his left begin sands which continue to the Oxus. That river here holding a course to the north of west while his course is to the north of east, and the cultivatable country being usually of an equal breadth, the tract of sands beyond it is necessarily widest to the west. With Bulk begins a country of a different character; the Paraparnisan still lies to the south, but the Gavee Paraparnisan, moreover, to the south-east, intervenes between this country and Cabul; and to the east, towards Budukhshan, are branches from the Hindookoosh. Hence is this tract very diversified, and while the south and east are generally hilly or mountainous, the north and west are generally level. Bulk is itself level, but has dependencies among the valleys of the Paraparnisan to the south. From Bulk, one very long day's journey of that quarter to the east or south-east,

lies Khoollum, which to the east rises into hills and mountains; this place is subject to Bulkh, the chief of which extends his dominion to within two days of Bamian, where begins the government of the Afghans. The intermediate country is hilly and poor. The chief of Bulkh has influence in the remaining part of Bactria, which lies to the east. Talikan alone is a hostile state, and is independent. Its hills are however less lofty and difficult than those of Ghoree and Khost to the south. Between Ghoree and Khost is Undurab, which is also mountainous. Koonduz lies to the north-west of those places, being in the road between Bulkh and Talikan, four days from the former and one from the latter. It is a level and fertile tract. If to these we add Huzrut Imam, situated thirty-five miles below the junction of the river Koocha with the Oxus and under Hissar, already mentioned as a state beyond the Oxus, we have enumerated the chief remarkable districts in Bactria.

20. The river Koocha in its upper course intersects Budukhshan in its lower boundary, the eastern and southern boundaries have been already mentioned. Its northern limits are more difficult to assign. The natives seem at present to restrict it to the country politically under the chief of Fyzabad (who is a Syud and is stiled Shah) which many consider as a convertible term for Budukhshan; it is situated on the left of the Koocha, five days east of Talikan. It is not easy to discover what extent the majority of European geographers wish to give to Budukhshan, but there seems little or no authority for extending it beyond the river Oxus, and it seems convenient to have a general term for the tract of country which the upper course of that river bounds. It is a diversified country, but its general character is ruggedness and poverty. The valleys are narrow, the mountains steep, the streams rapid;—by far the greater part is subject to Fyzabad. To the north beyond the river are Durwaz, Wukheeha and Keerategin already mentioned, and whose natural character is very similar.

21. The Gavee mountains which have been shewn to connect the Hindookoosh with the great body of the Paraparnisan, divide Bactria on the north-west, from Cabul on the south-east. One of the most frequented roads passes through Bamian and Goorbund, which are narrow tracts. The delightful valley of Cabul is open only to the south, where some inconsiderable heights divide it from the table land of Ghuznee, which here inclines to it. Cabul is politically divided into four tuppas or districts, Logur to the south, Kodamun to the north-west Pughman to the west, and Bhootkhah to the east. To the north and north-west is what is called the Kohistan or highlands of Cabul, in

which the chief valley is that of Punjsher; Ghoshund and Bamian are not included in this term, and lie more to the west within the skirts of the Paraparnisan. East of the valley of Cabul, after a considerable descent, we arrive at the country of Lughman, lying low, under lofty branches of the great northern chain. It is situated to the north or left of the Cabul river, is on the right in the most frequented roads from Peshawur to Cabul, and is of an extent far inferior to that of the valley of Cabul. To the south-east it borders on Jellalabad, a city and district on the right of the Cabul river, diversified with mountains, hills, and plains; its plain is somewhat less spacious than that of Lughman. The city of Jellalabad is passed in all the roads from Peshawur to Cabul, between which places it is nearly intermediate. To the south is the White mountain, the loftiest of the range of  $34^{\circ}$  north, and north-east of Jellalabad beyond the Cabul river is the narrow valley of Koonur, lying on the left of the Kashkar river, which joins that of Cabul opposite Jellalabad. To the west of Koonur lies Lughman.

22. In the enumeration of the chains of mountains, have been already mentioned a branch proceeding from the great northern mountains along the left of the Kashkar river (6) and a branch or branches leaving the range of  $34^{\circ}$  to the east of Jellalabad, and running in a north-east direction (11). The detached branches of these appear to unite, and together they divide the various districts already mentioned, from the greatest of the plains, which are situated between the great northern and the  $34^{\circ}$  chain of mountains. This great plain lies from the foregoing in easterly directions. Although there be no complete interruption to the continuity of this plain, yet do the strait roads between its detached portions sometimes pass over branches from the mountains which bound the whole; that between Peshawur and Bajour conducts north-west, through the Mikmund or Ootman hills (11); we may therefore distinguish Bajour, with the adjoining districts of Punjkera, from the remainder of this great plain which may be called from Peshawur the greatest city it contains. Bajour is peopled by the Purkulanee tribe of Afghans, who are not a part of the Yoosufzyes as supposed by Major Rennel. The chief inhabitants of Koonur are the Degans, who here speak a peculiar tongue. Punjkora is so called as being peopled by five houses or branches of a subdivision of the Yoosufzyes. The plain of Peshawur after those reductions is still comparatively spacious in a country so mountainous as Afghanistan. To the north it has the great northern range, which sends branches into it, forming the upper parts of Swad and Bhooner, while



the lower are level ; to the south it has the range of  $34^{\circ}$  ; and to the east the Indus. Its western boundary has been already detailed. The Yoosufzyes are a numerous tribe, who disregard the royal authority.

23. South of Cabul is the table land of Ghuznee, the boundaries of which to the east, north, and west, have been already mentioned. To the south or south-west it slopes into Khoorasan. It is far from being a perfect plain, having many slight inequalities. Proceeding eastward, we find the Jajee valley, that of the Torees, and others proceeding from the south side of the range of  $34^{\circ}$ , and some of less note which penetrate into that of  $32^{\circ}$  and the Jadran range. At a considerable distance to the south-east is the valley of Bunnoo, situated between the salt range, and the range of  $32\frac{1}{2}^{\circ}$  towards its eastern extremity. It is of an extent far inferior to that of Peshawur. A branch of the salt range divides it from the narrow territory peopled by the Eesa Khel tribe and others to the north-east. It lies on the right of the Indus, and terminates to the north, where that river is closely hemmed in at Kalabagh by the hills. These hills divide it to the north-west from Malgeen, as they divide Malgeen on the north from Bunnoo on the south. Kohat lies still more to the north under the range of  $34^{\circ}$ , and to the west it has Upper Bungeish, a hilly tract. Both Malgeen and Kohat are diversified moreover with very low hills, which seem generally to be from east to west. Neither are spacious.

24. The Eesa Khel plain is bounded to the south by the river Koorm. Beyond that river seems to begin what is by the natives called Daman, a term strictly meaning the lands at the foot of a range of mountains or hills ; in this instance it has perhaps a more general meaning, and includes even some low hills of this quarter. It ends to the south at Sunghur, where begins Sindh. Like most other terms partly descriptive partly arbitrary, it is not by all used in the same latitude, and it seems doubtful whether we are to include in it that tract in which is situated Dera Ismael Khan, and which the natives call Mukulwad. It lies on the right of the Indus, which bounds it to the east. The hills are here at a considerable distance from the river, but both to north and south they approach nearer it. The Dawan most strictly so called, lies west from Mukulwad. I know not whether it be considered as extending to the south, between Upper Sindh and the Sooleemane hills (see Para. 14.)

25. There being little to add respecting the southern parts of Afghanistan not comprehended in Khoorasan, we may proceed to Sindh

beginning as before mentioned at Sunghur, a place lying in north latitude  $30^{\circ} 40'$ , and east longitude  $70^{\circ} 45'$ . The term Sindh seems to have been originally descriptive; Sindh in the ancient Hinduwee signified ocean, or great river. The people inhabiting the borders of the Indus in process of time applied it to that river as being the greatest and most important; they knew rivers are in all countries great features of a country, but chiefly where it is low and champaign; we need not therefore be surprized if in such cases the tracts lying along the various rivers be named after them. This practice has probably been more general in former times, before foreign conquest introduced new and arbitrary terms, and fiscal or political divisions were adopted, little coincident with natural ones; the last, however, are those chiefly recognized by the cultivators, and various instances still remain to exemplify the principle just mentioned. Were it applied in strictness, Sindh would include all the country at a moderate distance from the river Indus, from its exit from the great northern mountains to the sea. In modern times at least other distinctions have quite superseded the term, if ever applied to the upper course of the Indus. It still remains applicable to the lower, during which it is that this great river is of most importance to the subsistence and comforts of the inhabitants. From Sunghur to the sea, the low fertile country to the right of the Indus is named Sindh; whether on the left bank of the river it ascends to the same latitude seems doubtful. On the one hand Buhawulpoor on the Ghara, at a considerable distance from the Indus, is considered as comprised in Sindh; on the other, Mooltan cannot be denied to lie in the Punjab. Leaving this in uncertainty, we may remark, that from Sunghur to the sea are three natural divisions. 1st. The most northerly in which lies Dera Ghazee Khan, and which may be called Upper Sindh, it may be said to end with the Sooleemane hills. 2nd. The middle division, comprizing the country of the Muzarees, who are independent Beeloches, and south of them the district of Shickarpoor. 3rd. The most southerly, now under the government of chiefs of the Talpoora tribe—this may be called Nether Sindh. To this alone it is that in our maps is given the name of Sindh or Sindhee, but all authority of native writers or native use is against this restriction, which if persevered in, must give rise in our dealings with the people of the country to frequent mistake. Sindh is a narrow champaign country. Its greatest width is in the middle division, and near the sea where the Indus forms a delta. The length may be 400 English miles and the average breadth 50. To the south is the Indian ocean, to the east is the great Indian desert, and

beyond it the Rajpoot states. The country of Kuchh extends from the most southern part of Sindh, in an eastern direction, towards Goojrat. It lies along the Indian ocean, and the name seems originally to have implied 'border or edge', but as the lands bordering rivers are usually low, Kuchh, Kuchhee, and other words from that root seem now in numerous cases to mean low and moist lands near rivers. To the north, Sindh has Mukulwad, the Daman, and the Punjab.

26. West of Sindh lies Bulochistan, there is here however a tract of country which is to be distinguished from both; if included in Bulochistan, it would form its north-east corner, and it lies west of the middle and of part of the upper Sindh; Aboolfuzl seems to have called it Seeweestan—a general term now little in use, but very convenient for us to retain. It contains Seewee, Gunduwah, Dhadur, Laree Bhag, Naree, perhaps Harnd and Dhajul, and some other towns and districts. It is itself a plain, but has in most quarters low hills for boundaries. A hilly but by no means mountainous tract intervenes between it and Candahar, and in that tract live the Tureens and some other Afghan tribes, while to the traveller's right hand are the Hakurs. At Gunduwah begin hills, and the country is hilly to Kelat, a distance of 120 miles in a direction about north-west. Kelat must be considered as the capital of Bulochistan, though not the greatest city. The surrounding country is but poor. In the western part of Bulochistan are the cities, towns, or districts, of Keech Mikran, Punjgoor, Dezuk, Bempoor, and others; this last is nearly SSW of Jellalabad, the capital of Seestan, from which it is distant 13 days journey. Of these the three only nearest to Jellalabad are inhabited when the direct road is chosen, but it is said there is a road more to the east which conducts through a country generally inhabited. From Bempoor to the sea it is said to be ten days, and to the first town in Kirman five days. In both cases the country is reported to be inhabited. On the coast of Bulochistan are some harbours of which the most noted is Kirachee, the longitude of which is not very different from that of Kelat. Nearly intermediate between them is Belo. The information is very scanty which is to be gained concerning Bulochistan, a circumstance which perhaps evinces it to be a country little productive or practicable. The chief population of Seeweestan is Indian, but the Beeloches are generally speaking the masters of the country. They are themselves divided into two nations, which were probably distinct in early times. The Koorgal nation is the superior, and its residence is chiefly in the west, and in the hilly tract wherein is situated Kelat. The Rind tribes dwell in the eastern quarters,

and are also the chief population of the south-west, so that in numbers they exceed the other nation.

27. To the north of Seeweestan lie the countries of various Afghan tribes; to the north of the western part of Bulochistan lies the country of the Bureches, that of the Dooranees, and Seestan; but the country of the Dooranees stretches a considerable distance beyond in a north-westerly direction. All these are included in Khoorasan. From Candahar to Hirat is a distance of 300 miles from ESE. to WNW. On the traveller's right is the Paraparnisan range, on his left Seestan, of which the capital Jellalabad lies 150 miles west by south from Candahar. From Jellalabad nearly due west, at the distance of 190 miles, is Nih, which though under a separate government is perhaps to be considered as in Seestan. From Nih the country of Ghaeen and Birjund lies north, and is of considerable extent. It lies from Hirat south-west, and from Furah (a considerable place on the left of the road between Candahar and Hirat) west. From Ghaeen, north-west, are Toorshish and Mushhud, which last place lies from Hirat more in a westerly than northerly direction. The country of Khaf lies west of Hirat, and north-west of it, towards Mushhud, is that of Toorbut. Jam and Murv lie to the north. The Afghan dominions end a short distance to the west of Hirat. These divisions which have been enumerated are political ones. The face of the country is too little known, and even if known, is probably too irregular and diversified to be distributed into natural divisions of well marked characters. But the country of the Ymaks, lying to the east of Hirat, is distinguished from all the others as being decidedly hilly, though indeed it possesses some wide valleys and some plains contiguous to the hilly tracts. Of these last the chief is that which lies north from the hilly tracts, but forms part of the north-east boundary of Khoorasan, and in which is situated Huburmach, a place already mentioned. To prevent mistakes it may be observed, that though this tract in general may justly be called the country of the Ymaks, part of that nation is found at some distance from it.

28. We have now rapidly sketched the countries lying west of the Indus, or north of its sources, and proceed to those lying eastward of it. Little Tibet has been already mentioned. It seems to be a country not easily practicable, for we are informed, that the trade from Kushmeer to Yarkund once passed through it because of the road by great Tibet having been forbidden, and that this was considered as an inconvenience. It is certain, a strait line between Kushmeer and Yarkund would pass through the little rather than the great

Tibet, and hence the objections to the former road must have been to its difficulty rather than its circuitousness. Little knowledge is to be gained of either country, but they are known to be poor. Great Tibet extends far to the east from Kushmeer, while the little lies west of that country. Little Tibet is as yet quite independent, except that a few of the low situated villages are now subject to the governor of Kushmeer. South-west of little Tibet, on the banks of the upper Kishengunga, is the independent territory of the Durds, which is very little known.

29. The delightful valley of Kushmeer has already been accurately described by Forster. West of it lies the district of Moozufferabad, abounding in low hills, and beyond it is Pukhlee, which consists partly in hills of considerable height, and partly in a plain or valley lying on the left bank of the Indus. South of it is Chhuchh, and south-east Huzara, of which both are plains. The former lies opposite the lower part of the plain of Peshawur, while Pukhlee is opposite to Bhooner. South of Chhuchh is the country of the Khatirs, and beyond them that of the Uwans, Dhuns, Gheps, and other tribes. The eastern part of this Doab of the Indus and Vehut is chiefly occupied by Pothwar, a country now in subjection to the Sikhs, but the exact limits of which are not easily assigned. A range of hills divide it from Huzara and the Khatirs. This Doab, as before observed, has numerous hills, and though low, they are sometimes very difficult. Where they end to the south begins the country of Mohummud Khan of Lya, which is here sandy and approaching to a desert. This and the other tracts as far as the mouth of the Indus are sometimes known by the name of Lumha, which means in the local dialect, 'south.' The territories of Mohummud on this side the Indus consist of high sands more remote from the river, and a lower and more fertile tract by its banks. The former is named Thul, the latter Kuchhee, both descriptive terms. Of the Kuchhee the southern part at least must be considered as in Sindh. Towards the angle of this Doab to the south the Thul is lost, and all the lands are low, moist, and fertile.

30. The whole of this Doab of the Vehut and Indus has now no name in general use. That of Sindhsagur given it by Akbar, is known only to the readers of the Ayeen Akbery, nor are any of the names given by him to the Doabs of the Punjab in common use. It seems doubtful whether that of the Vehut and Indus is to be considered as part of the Punjab, which many consider as restricted to the space included between the Vehut and Sutluj. To the south-west it

draws to a point where the five rivers are assembled in one stream, and to the north-east it is bounded by the great northern mountains. Within these mountains are many independent states, and also some of the dependencies on Kushmeer, for instance Poonuch and Rajwer. From Jelum on the Vehut to Lodhiana on the Sutluj is about 250 miles of road distance. The Punjab thus restricted is a country universally plain. From Lodhiana to Delhi is 220 miles of road distance, through a flat country; at some distance to the traveller's left, or to the south-west, begins the great Indian desert, which extends to near the sea, dividing the lower Punjab and Sindh from the Rajpoot states. Of these we may mention Jodhpoor to the south, and Beekaneer more to the north. Bhutner lies at the northern extremity of the desert, in a country not naturally unfertile.

### *Rivers.*

31. Of the rivers in these countries the greatest is the Indus, some have considered it as the boundary of Hindoostan to the west. Both now however, and formerly, we find the Hindee race and language far to the west of the Indus from its first exit from the great northern range to its falling into the sea. It must be considered an unnatural arrangement which should assign the eastern part of the narrow country of Sindh to India, and the western to Persia or Bulochistan. Other boundaries less simple and marked must therefore be sought for. By the inhabitants of Sindh this great stream seems best known under the name of the river. The Punjabees and people in general of the Hindee race distinguish it as the river Sindh; Persians and Khoorasaneees either soften this into Sind, or name the river by the addition of some conspicuous town on its banks, a practice not unknown even to the inhabitants themselves, hence it is best known to many as the river of Attoc. The Afghans have called it 'Ubaseen,' that is father or venerable river; *seen* in their language signifying river. But if we trace upwards the stream thus distinguished by them, we shall find they have selected the lesser, instead of the greater and more remote branch. The Ubaseen of the Afghans rises in the southern face of the great northern chain only 120 miles in a NNE. direction from Attoc. About ninety miles from that place it falls into the true Indus, which comes more from the east. The course of the true Indus is but conjectural, but may be safely said to be long and its source remote, in the table land (see para. 7.) From where it leaves the lofty mountains to the sea it runs in a direction  $24^{\circ}$  west of south, and though it have many

windings, it takes few great sweeps. As far as Attoc it is a rapid river, but at Kalabagh, distant thence 80 miles, it is very slow and still; it is no longer confined on both sides by hills, though to its right are sometimes found hills, and assumes all the well known characters of a river flowing through a champaign country and yielding soil. At Kuherree after having been joined by all the waters of Afghanistan, it is in the ebb season about 1000 yards broad, and where deepest twenty-one feet deep, with a current of two and a half miles an hour. Not far from Mithundakot it receives from the left the Punjnud, in which are collected all the waters of the Punjab, but which is yet much inferior to the Indus. After this junction, that river probably exceeds the Oxus in quantity of water.

32. The Hydaspes is the most westerly of the five rivers of the Punjab. This name originally imposed by the Greeks, is an evident corruption from Vidusta or Velusta, its ancient name in the country, and which the natives of Kushmeer still retain; by the Punjabees it is called Vehut, which the people of our provinces change into Behut; strangers in general usually name it the river of Jelum, from a town of that name built on its left bank in north latitude 33°. Here is a famous ferry, and in the ebb season it may be forded, though with some difficulty. Here too the Punjab may be said to begin, for in the northerly directions are mountainous tracts. The Hydaspes rises in the valley of Kushmeer, and having a slow current in deep muddy banks, soon becomes navigable. Before leaving the valley it joins from the north the Lar river, so called as intersecting the district of that name. After leaving Kushmeer the Hydaspes becomes rapid and unnavigable. At Moozufferabad it receives from the right the Kishengunga, a far inferior stream rising in little Tibet. Various mountain torrents now add their waters, and arriving at Jelum it has gained almost its utmost size. Until it reaches Pind-Dadun Khan, it is at intervals confined by hills on its right; at Rushedpoor it falls into the Acesines, and near Ahmedpoor the joint river receives the Hydraotes. The Acesines as being the largest and central gives its name to the three, which thus united in one stream pass Mooltan, lying about six miles from the left bank; and at Sheenee Bhukhuree, fifty-six miles from that place, is their conflux with the Ghura, which contains the two eastern rivers of the Punjab. The five rivers thus assembled are called Punjnud. The Punjnud had formerly but a short course before it joined the Indus, and perhaps the term was not then used; but in consequence of an extraordinary rise of the rivers about twenty years ago, their channels were changed, and the Punjnud now runs for about fifty-one

miles parallel with the Indus, which at length it joins opposite to Mithundakot.

33. The Acesines is certainly the largest river of the Punjab. In ancient times, as we are informed by Aboolfuzl, it was called Chunderbhaga, from its being formed of two mountain streams, Chunder and Bhaga. The name Sandabilis used by the latter writers on India among the ancients, seem derivable from Chunderbhaga, but the etymology of Acesines is now obscure. The inhabitants of its bank at this day though not ignorant of the ancient appellation use not it, but Chunkâ, which we and the Persians have changed to Chunab. This great river rises in Kishtwar, a dependency of Kushmeer. There is little reason to think that any of the rivers of the Punjab rises beyond the great mountains in the table land. The Acesines is forded with difficulty even in the ebb season. The Hydraotes was formerly, in the country, called Irawutec, and now Ravee. It is by far the least of the five rivers.

34. To it succeeds the Hyphasis, anciently called by the natives Bypasha, and now Beak or Beas, and lastly the Sutluj. The Sutluj was by the Greeks called Hesùdrus. Its ancient name was Shutoodr, and in Peshawur it is to this day usually called Sutloodr; it is inferior to the Acesines, but seems equal to the Hydaspes; yet did the Greeks call the joint stream of the Hyphasis and Hesudrus by the name of the former, a much inferior stream. At present both names are lost, and the river formed of them near Feerozpoor is first called Neelee, and afterwards Ghara, or Ghuloo Ghara; it is no where fordable even in the ebb season, but both its branches are. We are informed by Aboolfuzl that in his time it separated into a number of branches at some distance below its formation. At present, although it have like other rivers of a champaign country small nullahs or branches, it no were sends off a considerable part of its waters. As before mentioned, it falls into the Acesines, nor is there any reason to think that when Major Rennell composed his map and memoir, it held a different course; yet has that excellent geographer rejected Arrian's authority for this fact, without assigning any reason.

35. Between the Jumna and Sutluj are various small streams, very important in a military point of view. The Kughur and some others fall into the Sursootee, a river the course of which has long been a problem. The late inquiries entirely confirm that account which is given in Franklin's life of George Thomas, by which it appears to be lost near Bhutner. There is however a tradition that in former times it passed to the south, and spread itself over the wide expanse of level hard clay in the centre and west of the great Indian desert.



36. By far the greatest tributary of the Indus from the right is the river running under Ukora and Noushuhra in the plain of Peshawur. Captain Wilford has called it the Lundkee Sindh, or little Sindh, a term partially used in the country; but it is to be regretted that in this as in very many other cases, rivers have no proper names as such, and distinct from the towns which may be on their banks. This river joins the Indus less than a mile above Attoc, but on the opposite side. It does not appear probable that it has ever passed under the name of the river of Attoc. Before the junction both rivers are fordable, but after it no longer so. The Indus is the larger in quantity of water as being more rapid, but the channels seem equal. The Ukora river drains a very extensive and various country. Its sources may be divided into western and northern. The most remote of the western are in the mountains which bound the valley of Cabul, which is watered by three principal streams. The least which rises to the south or south-western runs through the capital; there afterwards joins it another from Ghorbund, and still lower that of Punjsher, the largest of the three, and which rises in Hindookoosh; other small streams contribute their waters from the right and left, but the rapidity is such that with all these additions the river is not navigable even by rafts until it join the stream of Lughman, which rises in the Kaper mountains to the north, and intersects that province. Although probably inferior in quantity of water, a gentler current admits of navigation on it by rafts before the junction.

37. Five miles east of Jellalabad joins from the north the Kashkar river, which is a rapid stream, and supposed to contribute three times the quantity of water brought by the united rivers of Cabul and Lughman; for about fifty-four miles the navigation of the river formed of these three streams is interrupted by no obstacle, yet are boats used in one place only (Dhukka) and there for ferrying merely; for about thirty-two miles further, to Micknee, occur at intervals, rocks, whirlpools, and cataracts, which are reckoned up to the number of thirty-two. The river in this space pierces the secondary range of hills already mentioned (see para. 11.) A passage down the river is at no season impracticable on rafts, but it is safest in the flood season, for although the violence of the stream be then increased, greater depth of water removes all danger arising from many of the rocks. The upper Mihmunds who live chiefly on the left of the river along this dangerous tract, take advantage of the difficulties of the traveller to rob him or extort a ransom.

38. From Micknee to the Indus the river flows with a moderate

current through the valley of Peshawur, which it fertilizes. A short distance below Micknee it divides into two branches ; the lesser, usually called the Shuhalum river from a village of that name, passes only four miles to the north of Peshawur. It unites twenty-five miles in a straight line from the point of division with the Hadezy or other branch, which had previously received from the north-east the river of Swad, inferior to itself. The river is now completely formed, and proceeds to the Indus a distance of thirty-five miles. It divides (though not exactly) the Yoosufzyes to the north from the Khutuks and other obedient tribes to the south. The Mihmudzy tribe inhabit chiefly the district of Hushtungur, lying on the left bank of the Swad river. In the Doab between it and the Hadezy live the Gugeeanees, and the upper Mihmunds and Ootman-Khel tribe bound them to the north and west. In the island of Hadezy and Shuhalum live the Daoodzyes ; south of them and the Shuhalum are the Khuleels, who live chiefly to the west of Peshawur, and the lower Mihmunds who live chiefly to the east of it ; to the east of them are the northern Khutuks. The people of the south of the plain draw but little water for irrigation from the river ; their neighbourhood to Peshawur and the great road exposes them to oppression and military rapine. The canals which formerly existed are now in a state of complete or partial decay. The Boodhunee however which rises from springs in the plain is increased to twice its natural size by the introduction of water from the Shuhalum. The Bara is a more important stream, though in size very inconsiderable. It rises to the south-west in Teera, a well peopled district, situated high on the range of  $34^{\circ}$ , and diversified with hill and plain ; whatever is suffered by the Afreedees, or people of that country, to flow to the plain, is by the government appropriated in the following manner—A certain quantity reckoned by the number of mills it can (if required) turn is taken for the use of the city and gardens of Peshawur. The remainder is to be equally divided between the lower Mihmunds and the Khuleels, but no rule has been established which does not give rise to unceasing jealousies and suspicions between these two parties, which often break forth into open war.

39. If computed from its western sources to its mouth, the general course of the Ukora river is a little to the south of east, according to the direction of the range of  $34^{\circ}$ , and in length, in a strait line, about 200 miles ; but its greatest streams come from the north. The Kashkar river rises remote in the table land. Before piercing the great northern range it receives from the east the Sheesa, which rises

behind them, contrary to the Ubaseen. After crossing the line of the great northern range it still remains hemmed in by its branches (see para. 6) and continues to its mouth a rapid stream. It is navigable for rafts only as far as Asmar, seventy-five miles from its mouth; thence upwards it is exceedingly rocky. In the ebb season it is fordable by horsemen in various places, and in some, a party of men on foot, by joining hands, can with difficulty cross it. At Chughsuræe it receives from the right the stream of Pech, running in a valley of that name, through which leads a road north-west to Budukhsan. The other northern stream is that of Swad, which has a general course from the north-east. Arrived in the plains it is joined in the north-west by the inferior stream of Punjkora. They unite near Khizree Khel, forty miles from Peshawur.

40. The other additions to the Indus are but inconsiderable. Pukhlee and Bhooner have their rivulets and torrents, and in the former may be noticed the fern much used in agriculture. The Huro rising in the territory of the Gakhurs (see para. 16) intersects Huzara and part of Chhuchh, but leaving it falls into the Indus between Attoc and Neelab, in the country of the Khutuks. The Swan, a much superior stream, rises in the district of Moozufferabad, and passing through Pothwar and some other districts of that Doab joins the Indus some miles above Kalabagh. The To rising in upper Bungush and Teera, waters Kohat and falls into the Indus after a short course. Malgeen has its rivulet. Bunnoo is well watered by the Koorm. This river has very numerous sources draining the left of the salt range, part of the left of that of  $34^{\circ}$ , the Jadran range, and the right of that of  $32\frac{1}{2}^{\circ}$ . Perhaps the chief is that which is traced to the White mountain, in which case the Koorm has a course from north-west to south-east. Its greatest tributary is the Gumbela, rising in the western part of the range of  $32\frac{1}{2}^{\circ}$ ; even at its mouth the Koorm is but a small river, and probably discharges not more than a tenth of the water discharged by the Ukora river. Still less is the Gomul, whose course is near the south or right of the range of  $32\frac{1}{2}^{\circ}$ . It does not in ordinary times reach the Indus, but is expended in the agriculture of the Daman. After heavy rains however it exceeds the demands made on it, and spreads itself over the Daman and Mukulwad on its way to the Indus.

41. In Afghanistan, south of the Gomul, and in the whole of Bulochistan is no stream of magnitude or whose waters reach the sea; it is in like manner with the Persian Khoorasan; but in the Afghau Khoorasan are some considerable ones. The greatest is the Kelbund

which rises contrary to the Ghorbund stream. After running a considerable distance in the Huzara country it enters that of the Dooranees, and passes to the west of Girishk. It finally discharges itself into the lake of Seestan. It is a rapid river, especially during the first part of its course, and the quantity is certainly considerable in the summer, but Mr. Forster who passed it at Girishk on the 17th November, 1783, describes it, without naming it, as a small stream of good water. In the ebb season it is fordable in certain places, but in that of the floods must be passed by means of boats or by means of pumpkins. Except towards Seestan, where the bottom is composed of sand only, the channel has a mixture of stone and sand. The banks are generally high, and the river never sends natural branches to a considerable distance. Art however has drawn out some canals. The most famous is that made by the late Payenda Khan Barukzy, and lately repaired in the midst of civil broils by his son and successor Futteh Khan. It is drawn from the right of the river. The general course of the Helbund is about south-west.

42. Not far below Girishk it receives the Urghundab from the left. This stream is of far inferior magnitude, and in the ebb season is easily fordable in all places. It rises in the south-eastern extremities of the Paraparnisan, not far from Sooltan Safee, and has Candahar not far distant from its left bank. It is afterwards joined by the Turnuk, or rather by a part of that little stream, for another part is lost in sands. The Turnuk drains part of the Kakur country and of the table land of Ghuznee, and is reckoned to have its principal source near Mookr. Equal to the Urghundab is the Khashrood, that stream which runs under Dilaram to its right. It rises in the Paraparnisan chain, and after a course nearly south falls into the Helbund near Kohinsheen, three days journey below Girishk. The Furahrood, so called from Furah, which is situated on its left bank, also rises in the Paraparnisan, but from parts of it more westerly; it never joins the Helbund, but pursues a separate course into Seestan, where according to some accounts it gains the lake; but according to others, is in the ebb season at least lost in the sands. It is twice as large as the Khashrood, and its course seems to be south-east.

43. Such are the streams which take their rise in the south side of the Paraparnisan. From the west rises the river of Hirat, called by the people of Khoorasan 'Pool-i-Malan,' and by those of Toorkistan 'Tejun'; it is the Ochus of the ancients, and is said formerly to have reached the Caspian sea. At present it is lost in the desert south of the Oxus in a direction north-west of Hirat. It is twice crossed in

the ordinary road from Candahar through Hirat to Persia. Except in the season of rain it is very small, and much of its waters are expended in agriculture. The ancient Margus or modern Murghab, whose sources are not far distant from those of the Ochus, is perhaps of an equal size. It runs nearly due north, and after passing Muro, at some distance to its left, pursues a solitary course through sands to the Oxus, which it barely reaches. A considerable rivulet from the Paraparnisan, waters successively the districts of Mymuna and Undkho, but never gains the Oxus. Bulkh has eighteen streams, but of those some are canals drawn by art from natural ones, rising in the mountains to the south. None of them can aspire to the name of a river. That called the Bulkhab is the chief. Advancing eastward we come to the stream of Khoollum, and after it, that of Koonduz, which is more considerable, and composed of three principal branches draining Talikan, Ishkumish, and Ghoree. This last is the most to the west or left of the three. The middle one it is which is sometimes known by the name of Bungee. The river composed of these three streams is equal to the Swad, and pursues a north-westerly course to the Oxus.

44. That great river, according to information received by Lieut. Macartney, rises from a glacier of the Poosht-i-Khur, a lofty mountain of the Belur. The natives of the country content themselves with tracing it to Durwaz, and usually confess their ignorance of its earlier progress. The first considerable stream it receives is the Soorkhab, or river of Keerategin, it afterwards joins the Koocha from Budukhshan, and the Oxus now ceases to be fordable. From being very rapid and precipitous, it now gradually assumes the character of stillness, and gently glides over a sandy bed to the Aral lake, where it is lost. Besides the tributaries already mentioned, the Zurufshan, or river of Bokhara, joins it when flooded; it has a south-westerly course. That of Keerategin runs nearly south, the Koocha north-west. The Zurufshan is but an inconsiderable stream in quantity of water, but is indispensable to the agriculture of Samarkand and Bokhara. The Oxus is by the natives of Toorkistan called Umoo, a name which strangers change to Hamoo; but during its upper course among the mountains it is called Punj. Its course is not much to the north of west.

45. The extreme sources of the Jaxartes are not far distant from those of the Oxus, but it holds a more northerly course. Towards its mouth however it is said again to approach the Oxus, and according to some it actually joins it before it falls into the Aral. In size it is much inferior, although a considerable river. Its chief tributary is the Chilchik, which falls into it from the north-east, a few miles above

Tashkund. The Jaxartes is now called Sir or Seer, but the Arabian geographers name it Syhoon, and the Oxus, Jyhoon. In the winter it is to be crossed in some places on the ice, but in summer rafts are used. In the Oxus both rafts and boats are used. The practice with respect to both, and on both rivers, is to yoke to them the passenger's horses and cause them to transport them across by swimming. Of the Neelum we know only that it falls into the lake of Aral, and comes from an easterly point.

46. Nor is our knowledge much more detailed of the streams of Chinese Toorkistan. All of them seem to be collected in one river, ultimately lost in a lake beyond Toorfan. Even this river is not reported to be of very great magnitude: this is another reason to disbelieve the existence of a very high and snowy range in this quarter, for such is ever found to give source to great streams (see para. 7.) The Tukkus is laid down in the latest maps as running north into the Russian territory, but according to the information received by us, runs south into the Chinese. The geography of this country seems destined to remain long obscure. It is no longer the scene of important events, nor does it lie in the line of traveller's routes. The cities of Kashghur and Yarkund are indeed visited by merchants of Kushmeer, Pushwar, Budukhshan, and Toorkistan, and from them tea, silver, and some other Chinese commodities are diffused over the neighbouring countries. Few however proceed further, and inquiry is scarcely safe under the jealous and vigilant government of China

• *Lakes.*

47. Most of the lakes of note have been already alluded to. The greatest is the Aral, which receives all the rivers of Toorkistan. Its waters are salt. Those of the lake of Seestan are slightly brackish. The whole of this last can be seen in one view by a spectator from the shore. It is encompassed by a tract of marshy land overgrown with reeds and aquatics, and a day's journey in breadth. In the middle is a little high island and on it a fort, this island is called Koh-i-zoor, and is in north latitude  $31^{\circ} 35'$  and east longitude  $63^{\circ} 25'$ . The well known Dul and Oollur are situated in Kushmeer. The latter is formed by the Uidusta; the former is unconnected with it, except that when raised by rains it discharges its superfluous waters into that river. No particulars are yet known of the lake of Toorfan (see para. 46) which is perhaps fabulous. Neither the

Aral nor the Seestan lake are navigated except by fishers or fowlers. The rivers too we have enumerated are more generally an obstruction to intercourse than a facility. Wood is indeed floated on them from the mountains, and in some cases goods are conveyed on rafts from a higher to a lower place. We are also to except the Indus and its eastern tributaries, which are navigated by trading boats as on the rivers of our own provinces. The trade thus carried on is indeed far inferior in amount to what is anticipated, and that especially in the case of the Indus. In lower Sindh and Kushmeer alone water carriage is the chief mode of transportation in the country. But these, and the particulars of ferries and fords, and modes of crossing rivers, need not be here mentioned in detail, since they are in the province of Lieut. Macartney. I may have appeared to have already greatly encroached on it, but this introductory matter seemed necessary to the readily and correctly apprehending what follows.

*(To be continued.)*







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ART. I.—*Memoir on the Climate, Soil, Produce, and Husbandry of Afghanistan and the Neighbouring Countries.*—By Lieut. IRWIN.<sup>1</sup>

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### • PART I.—OF CLIMATE.

#### SECTION I.—*Of Temperature.*

48. Even the most northerly parts of these countries lie in latitudes considered warm in Europe. But it is sufficiently known that latitude alone does not decide the temperature of countries. In the same parallel of latitude in the Russian empire the heat is less as the eastern longitude is greater. The causes of this difference seem yet unassigned, and until they be both assigned in a satisfactory manner, and shewn to be common to the southern parts of Europe and Asia in the same longitudes, there is but slight ground for concluding *a priori* the fact to be similar in them. The influence of altitude however on the temperature of place is undeniable, and exemplified in many familiar instances. Nor can it be denied, that the greater or less frequency and severity of rains must affect the heat of a place. Other causes might also be mentioned, for instance, the course of the winds. Distinct also from those which influence the annual heat of any place, there are causes which affect the equability of heat during the succession of the seasons. Maritime places have a temperature more uniform than inland. Even considerable inland lakes communicate a more equable temperature to their banks. The effects are the same of moisture in the soil. Countries whose surface is chiefly formed of sand or stones have more

<sup>1</sup> Continued from p. 776.

rigorous winters and more sultry summers than others in similar circumstances. The periods of the rains, the course of the winds, and perhaps some other circumstances, are to be weighed when a theory is to be given of the phenomena. I here content myself with detailing facts as far as known, with occasional reference to probable causes.

49. From Delhi to Peshawur, by the royal road which conducts through Lodhiana, Umrutsir, and Rohtak, the heat of the climate as estimated by that of all the seasons of the year, generally speaking, gradually diminishes. Even at Lodhiana, it is said, few nights are known in the season of greatest sultriness which have the oppressive heat of those sometimes experienced in our provinces. Whenever the road conducts near the great northern mountains, unusual coolness is experienced; but the neighbourhood of inferior hills seems in the summer at least to increase the heat. To this cause, and to the scantiness of the summer rains, we may attribute the sultriness of Peshawur in the midsummer. All the natives agreed in representing the summer of 1809, which was partly passed there by the Embassy, as unusually cool. Yet the heat by day, of the weather in May and part of June was considerable, and was on the increase when we left that place on the 12th of June. No relief is in ordinary years to be expected until the month of July, when either showers fall or the air is cooled by winds from the east, in which quarter the rains have commenced. Hence June may be concluded a warmer, or at least as warm a month as in Delhi. If the summer of 1809 be not supposed altogether singular, the nights in Peshawur are seldom disagreeably warm to those who avoid sleeping within the houses, and prefer the terraces. The summer too is of later commencement, and declines sooner than ours. The whole of the month of March may be excluded from it. The Hinduwee month *Ussoo* or *Koonar*, beginning on an average on the 13th September, is there called the first-born of the winter, an epithet it by no means deserves in our provinces, in which September is often warmer than August;—add to this, that the winter season is severer in Peshawur than here. Old persons remember a fall of snow, which, however, they acknowledge instantly melted. Frost is very frequently experienced in every season. On the whole then, it cannot be doubted that the annual heat is less in Peshawur than in any part of the Bengal provinces, except the skirts of the great northern hills. In this and many other cases we should be deceived were we to build conclusions on the proverbial expressions of the country, without inquiring by whom, and on a comparison with what, they are spoken. To the Afghans of the hills, Peshawur may seem

the seat of the most intolerable heat, because situated not far from temperate climates, and still the annual heat be under that of Delhi.

50. Bajour and Punjkora are considerably cooler in summer and colder in winter than Peshawur; a winter does not pass without a fall of snow, which is perhaps not melted in less than two days, sometimes a much longer space. Even in Koonar snow falls, though it soon melts except in the shade. Lughman is warmer in a small degree than Koonar, and Jellalabad than Lughman. These positions are to be understood of the plains only of these countries; the hills and mountains are cooler than they, and in a degree proportionate to their height. But during the summer there is generated the most excessive heat among the low hills of the Turnkzy tribe of the upper Mihnunds, which from their bareness and dryness are commonly called the Bedoulut hills. Kohat is supposed to be a little cooler than Peshawur, and Malgeen is probably of a temperature the same as that of Kohat. Bunnoo and Eesa-Khel cannot be very different. The plains of Chhuchh-Huzara and Pukhlee are probably a little cooler than that part of the plain of Peshawur in which the city is situated. Moozufferabad is cooler than they, but is still to be pronounced a warm climate. Snow falls in Khanpoor of the Gukhurs. The more southern parts of this Doab are warmer.

51. The nether part of the Punjab, which includes Mooltan, is far warmer than the upper, and that for several reasons—a lower latitude, rains much more scanty, and the greater distance of cold mountains. The winter in Mooltan seems severer than in our provinces, and as in Bengal is accompanied with mists. The summer-heat, on the other hand, is probably greater. Mooltan, Seeweestan, and the Daman, are proverbial for heat. The nether Sindh is perhaps cooler, although situated more to the south, because it has more abundant rains. Its summer is certainly far cooler, being moderated by the neighbourhood of the sea; but, on the other hand, the same circumstance abates the cold of its winter. Notwithstanding its lowness, and probably moisture, the climate is much commended, especially in the southern parts. The country of Kuchh and the coasts of Bulochistan have a similar climate, neither hot in summer nor cold in winter. Kirachee is represented as unhealthy. The interior of Bulochistan is in general a hot country, but when the hills rise to a considerable height the climate becomes temperate. In Kilat snow lies on the ground during the greater part of winter; the summer however is warm. There are some inhabited places even colder than this in Bulochistan, on the whole however that country must be described as a warm one.

52. Cabul must be reckoned a temperate, perhaps a cold climate. In the three signs of the zodiac, Sagittarius, Capricornus, and Aquarius, the snow lies in the neighbourhood of the city. In Pisces it melts in the low and frequented places, but remains in the higher and less frequented. In this month are copious falls of rain, sleet, and snow. The first day of the ensuing sign of Aries is the vernal equinox, by the Persians and the people of these countries called Nouraz, because with it the natural year is considered as commencing. In Persia especially it is celebrated with much joy and festivity. In this month whatever remains of the snow melts in the plains. The summer which now succeeds is so temperate that the heat in the shade is never disagreeable, and no night is so warm as that a thick covering can be dispensed with. But the heat of the summer's day must be greater and steadier than in England, since rice and maize ripen in this district. The heat of the mid-day sun is indeed described as very great, and equally disagreeable as in the warm climate of Peshawur, where though the heat be unquestionably greater, its effects on the feelings and constitution are moderated by a more copious perspiration. The fact is to be accounted for, not by supposing the atmosphere of Cabul a moist one, for on the contrary the air of high places is usually dry, but by the difference of temperature. A temperature uniformly high, both in the sun and shade, in Peshawur keeps open the pores, which thus admit of a perspiration which relieves the body, but in Cabul they are kept shut by the coolness of the air in the shade. Cabul although warmer in the summer than England, is probably colder in winter. This we are to attribute to a situation more inland, and a sky less overcast; for it is certain that clouds moderate both heat and cold, as indicated by the thermometer. The climate is on the whole good, but is more commended by the opulent than the poor, of whom many leave the district in the winter for the warmer ones to the east, induced by the severity of the cold, the scarcity of fuel, and the difficulty of obtaining employment and wages in that season.

53. The valley of Cabul itself is diversified with inequalities of surface and varieties of exposure, and the neighbouring districts still more so. The temperature varies accordingly often within short distances, and it is impossible to give accounts more than generally true. The Kohdamun is colder than the immediate vicinity of Cabul, or the eastern part of the valley. The Kohistan and Ghorbund are colder than the Kohdamun. The summer heat of Ghorbund is said to be distressing to the Huzaras of the neighbouring hills. We have

seen that the Huzara mountains are not of the greatest height, but the cultivated and inhabited valleys being little beneath the level of the mountains are remarkable for their cold. In some of them the wheat harvest is scarcely completed in September. Some of those which open towards Bactria are warmer than Cabul, and the cotton plant is cultivated with advantage. In Cabul it may be and is raised, but the produce is little. Ghuznee and all the places situated on that high plain are noted for cold. That city is said to have been buried in snow nine days after the vernal equinox, yet I apprehend the real cold is not very different from that of Cabul, since the operations of agriculture and the harvest are but a few days later. To the feelings the cold of Ghuznee is made more sensible because of the want of shelter in the country. Mookr and Kura-Bagh are warmer than Cabul, and from Ghuznee to Candahar the temperature increases every stage.

54. Kushmeer is like Cabul a high valley, and in latitude somewhat more northerly. It is certain the winter is milder both in reality and to the feelings. The same periods are indeed assigned to it, and the snow lies during the same month, but it does not possess that cold felt in Cabul. The natives with no other protection to their feet than sandals of rice-straw travel in it without apprehension, and even in the depth of winter pass the heights which separate their valley from Kishtwar and its other dependencies to the south. Instances are rare of their losing their toes or fingers by the frost, but this is no uncommon occurrence to travellers in the countries of Cabul and Ghuznee. The wolf of Kushmeer has not that ferocity which he possesses in the severer winter of the last mentioned quarters. It is true the Vidusta is sometimes frozen over, whereas the river of Cabul after the junction of the Ghorbund stream never is; but a sufficient cause of this difference is seen in its greater rapidity. The summer of Kushmeer is probably of the same temperature as that of Cabul, but it is oftener cooled by showers. The complexion of the natives, which is usually a yellowish sallow, seems to indicate a climate on the whole warmer than Cabul. The Cabulies descended of families long established in their valley, are nearly as fair as Englishmen. To the feelings it is certain Cabul has the colder air, by reason of its breezy climate, while Kushmeer is a still climate.

55. It would be a tedious task (even were it possible) to particularize the temperatures of the various inhabited places among the mountains and hills already enumerated. They may often be conjectured to a considerable degree of accuracy by adverting to some circumstan-

ces formerly detailed—the height of the hills, their character, whether steep or tame, and that of their valleys, whether deep and narrow, or the contrary. Slopes and plains even of moderately high hills have a cool and healthy air, but deep vales in the bosom of even the highest mountains have a hot summer, rendered still more disagreeable by stagnation of air, yet even they are warm only in comparison with their immediate neighbourhood. Of this class is the valley of Chitral, so called from a town situated on the Kashkar river, and the capital of one of the four principalities of that country, (see paragraph 17.) The numerous valleys of Swad, Bhooner, and Pukhlee are warm, as is that of Khost, comprehended in the revenue division of Bunnoo, from which it lies in a westerly direction, in the bosom of the range of  $32\frac{1}{2}^{\circ}$ . The valley of Jajee is as cold as Cabul, that of Torree is warmer. Teera situated on the range of  $34^{\circ}$ , Oorgoon on that of  $32\frac{1}{2}^{\circ}$ , parts of upper Bungush, and the valleys in the Jadran range are somewhat warmer than Cabul. Zhob, in the Kakur country, is much warmer than Cabul, but much colder than Candahar. Even Pushing, or as the Afghans call it Psheen, the country of the Tureens, is somewhat cooler than Candahar; but Shorabuk, or the country of the Bureches, is of the same temperature.

56. The country of the Dooranees considered as a whole, is of a temperature intermediate between Cabul and Peshawur, but exhibits considerable diversities within its own extent. Teeree, inhabited partly by Huzaras partly by Dooranees, is a cold place, falling not much short of the warmer parts of Cabul. The country called Zumeendawur, lying on the right of the Helbund in its further progress (see para. 41) is a temperate one. No winter there passes without snow, but to it succeeds the *gum seer* (so called even in Tamerlane's time) in which there falls no snow. It lies WSW. of Candahar, which is only a little cooler. In some winters snow falls there, but it soon melts. The intensity of the summer heat is however moderated by western and northern breezes, and close nights are quite unknown. Few towns are more healthy than Candahar. Furah, although in a latitude somewhat higher, is warmer than Candahar; Subzwar, or Isfazar of the Zooree tribe, is much cooler, by reason of its being situated on high land. Hirat is still cooler, and is probably not very different from Bokhara, to be afterwards mentioned. Still colder are the vallies of the Ymaks, which are yet far more temperate than those of the Huzaras, and generally speaking similar to Cabul. In Muro snow lies but a short time after falling. Toorshish is in a temperature perhaps the same as Hirat, and

Mushhud is considerably colder than both. Mushhud and Kilat of the Beéloches may be conjectured to have an animal heat not very different. Ghaeen and Birjund are various in different places, but generally may be pronounced intermediate between Hirat and Candahar. Seestan is warmer than the *gurm seer*, yet contains hills on which snow falls in the winter. The great desert to the south has a most sultry climate.

57. Snow falls every winter in the whole of Toorkistan, unless indeed there be any exception in the deserts towards the Caspian, of which our information is in most particulars very scanty. This country sloping westward, the eastern quarters are the coldest; but in the distance of a few miles there is frequently great differences of climate. It also deserves remark, that the kingdom of Bokhara and other parts west, being open countries, are also windy, and their air sharper to the feelings in the winter than that of the east. But no doubt exists of their real cold being less, for their winter is shorter, and the snow sooner melts. In Bokhara it seldom rains, but snows in the sign Sagittarius, which begins the 20th November. Snow falls knee deep in the course of the ensuing month Capricornus, and that quantity melts in five days. In some years there happens much greater falls, and it has been known to snow after the vernal equinox. The spring and autumn are generally temperate, and two months only of the summer are hot, namely Cancer, which begins the 20th of June, and Leo, but especially the former; the noon-day winds then feel warm, but close nights are not known. The natives are not so fair as the Cabulies. Khwaruzm is warmer than Bokhara; the kingdom of Kokur is colder, and has both a healthier and pleasanter climate, though Bokhara cannot be said to be unhealthy. Taskund is nearly similar. The Kinghuzes live in a colder country than the Kuzzaks, whose country is yet colder than Bokhara, and not much warmer than Taskund, which borders on it to the east. Keerategin is a cold country, but some places are much colder than others. The town of Durwaz is noted in its own neighbourhood for heat, being situated in a deep and narrow valley.

58. Budukhshan being composed of vallies which take their origin in mountains covered with perpetual snow, and whose months have nearly the same level as the lower parts of Toorkistan, thus possesses great diversity of climate. In many of the loftier parts the crops are in some seasons spoiled by the frosts before ripening. All the considerable places, however, lie in temperate climates. Fyzabad is warmer than Cabul. The Koocha is not known to freeze at that town or



below it. The river of Koonduz, in a far warmer country, freezes every year so as to admit of horses passing it, but its current is more sluggish. In Bactria there is considerable diversity of climate, arising from circumstances already mentioned (see para. 19.) The climate of Bulkh is perhaps the warmest; summer and winter succeed one another by a very rapid transition, and both are severe. These circumstances coupled with the moisture of the air, render the place neither healthy nor agreeable, and the natives of Cabul had the greatest aversion to serving in Bulkh when that place was in reality, as now it is in name, under their monarchy; many of its villages, however, are healthy. Koonduz though low, moist, and warm like Bulkh is yet more healthy. The districts to the south and east are colder in various degrees. The lower part of the valley of Khost is warm, and no place in Bactria is so cold as Cabul. Shibirghan, Undukho, Mymuna, and Kuburmach are healthy, and their temperature somewhat less than that of Bulkh.

59. Chinese Toorkistan although in general more northerly than independent Toorkistan, has not a colder climate, but rather the contrary, for the inhabited places are for the most part in low plains. Kashghur is colder than Yarkund. The temperature very gradually declines as we proceed to the more northern parts. The Pamer is exceedingly cold, yet may be crossed in autumn. With the exception of Chitruil, already mentioned (see paragraph 55.) Kashkar is undoubtedly a cold country, but to what degree we cannot yet tell. All the Tibets have rigorous climates, considerably colder than Cabul, even in the cultivated vallies. Between the Tibets and Hindoostan, the Punjab and other countries to the south and south-west, there is every degree of temperature, from mountains clad in never melting snow, to low and sultry plains.

## SECTION II.—*Of Winds.*

60. In most countries it requires the observation of many years to determine what winds on the whole are predominant, and in what seasons of the year; we are otherwise in danger of stating local and temporary phenomena as general and constant. In the total want, in the present case, of such records, and under the necessity, moreover, of relying on the testimony or rather opinion of others, who may not have considered the subject with the patience it requires, it must be expected that the present account shall be meagre, perhaps in many points erroneous.

61. Some facts however seem to be established on sufficient evidence. It may be asserted that in the whole of Toorkistan, Budukhshan, and the north in general, the prevailing wind is from the north. In Bokhara it blows with considerable violence in the signs Cancer, Leo, and Virgo ; after three months cessation, it recommences, and blows, though with less vehemence, during Capricornus, Aquarius, and Pisces. These may with propriety be called midsummer and midwinter winds. The former are sometimes felt warm by day in Bokhara, the latter, when strong, are felt piercingly cold. Both vary from time to time in strength, blowing for seven to ten days with violence, and then remitting for nearly an equal time. In the wide space in which this northerly current prevails it may be supposed to have considerable variations in its direction, (for it need not be supposed to be always due north) strength, and other circumstances. It is not constant and strong in the west of Toorkistan, but it has occasionally given melancholy proofs of its power. It has submerged under sand the far greater part of the kingdom of Khwaruzm, and yearly curtails the habitable lands of Bokhara. The same evil consequences are not apprehended from the north winds in the quarter of Bulkh, yet even there they occasionally blow with great vehemence. In the war which Ty-moor Shah waged in that country with the Oozbeks, there were six successive days in which these winds suspended all hostile operations. Budukhshan, except in some particular situations, has a still climate, by reason of the shelter afforded by its lofty mountains, and is not so breezy as even Cabul ; the north winds however are there also the prevalent ones, though much diminished in their strength. It deserves remark, that the Persian word 'Shimal,' which properly means 'the north,' is in Toorkistan, Budukhshan, and the north in general familiarly understood by the signification of wind. In the Persian Gulph, the same denotes a blast. It is remarked in Bokhara that the south-east wind there, called 'Kypung,' is productive of great warmth, and when it occurs in the spring, the snow rapidly disappears.

62. If we pass from Toorkistan to Khoorasan we still find the same northern current to prevail in the western parts of that province—little change takes place in its direction, and even at Hirat it seems to be from nearly due north, but in longitudes more easterly its direct progress is opposed by the Paraparnisan mountains, which shelter that part of Khoorasan which lies to the south of them. At a moderate distance however from these mountains the current seems to recommence, though with diminished force and altered direction. It now inclines to the east of south, or even blows due east, as if to reach

the Afghan Khoorasan, it had been compelled to travel round the western end of the Paraparnisan range. In Candahar the direction of the midsummer winds is perhaps from the north-west, but at a considerable distance south from the Paraparnisan mountains the current resumes its force, and perhaps nearly returns to its former direction. In Seestan such is its force, that it has heaped up the sands of that country into waves; not a season passes but whole villages are buried under the sand, the inhabitants escaping with little beyond their lives, yet do they deem these winds a blessing. They moderate the heat, relieve them at times from the musquitos, and they turn their windmills. At Kilat of the Beeloches the midsummer winds are from the north, for this place is situated too far to the south to be effected by the Paraparnisan mountains.

63. Hirat lies open to the north, and if we except Seestan there is no part of Khoorasan where these winds blow with such vehemence as in its neighbourhood. It has a windy season of 120 days, which returns with such certainty, that relying on it they here use no watermills, but windmills only. These periodical winds seem to commence earlier in Hirat than in Bokhara, and in Seestan earlier still. In that part of Khoorasan which lies west of Hirat the summer winds though of considerable strength and regularity, are not relied on for grinding the whole of the crops, on the contrary watermills are commoner than windmills; in former times the latter were more used than now, as is proved by the ruins to be seen in the districts of Cabul, Muro, Zumundawur, in certain parts of the table land of Ghuznee, and other quarters where watermills only are now employed. This change of practice may have arisen from a change of opinion, watermills having been found more eligible in all but the most windy climates, as being oftener at command than the others. or it may be considered as one proof of what all the natives assert, that the seasons and weather have altered from what they were in former times.

64. I know not how far southward we can trace these northern and north-western winds, but in the eastern longitudes at least they do not extend to the Ocean. The wind there on the contrary, blows from the south during the greater part of summer. We can trace this wind as far as Buhawulpoor, in latitude  $29^{\circ} 22'$ , and perhaps a good deal further. This southerly wind blowing from the ocean, communicates to the climate of the nether Sindh an agreeable coolness. At Mooltan it shews itself rather in occasional blasts, than a constant current. By parity of reason these southerly winds may be supposed to extend a certain distance (varying in different longitudes with cir-

cumstances) from the ocean into Bulochistan. But we have already seen (paragraph 62) that it does not reach Kilat, the latitude of which is not very different from that of Mooltan. In Jodhpoor it is said the west or north-west wind is the commonest in the spring and summer months, until the commencement of the periodical rains. In the upper Punjab also the winds are represented as being in the various seasons not very different from those of our Upper Provinces. In both countries clouds seem to assemble from easterly points (especially in the rainy season) and winds from westerly points shed their contents.

65. The winter of 1808-9 was spent by the Cabul Mission chiefly at Beekaneer, between that place and the entrance into the hills beyond the Indus. It was remarked as being singularly still; and generally it may be asserted, that in all these countries the winter is calmer than the summer, the night also is usually calmer than the day. Travellers tell us that such is the cold of the Pamer in the autumn—the season in which it is most commonly passed—that did not the wind die away by night, this route would not be practicable. As before observed the mid winds of Toorkistan are not so strong as the midsummer, and in Khoorasan they are not always traceable. In Candahar and some other situations, the month of October is more remarked as windy, than the depth of winter. The cold winds of that month, or rather of the sign Scorpio, which begins the 20th of October, strip the trees of their foliage. The same sign of the zodiac is windy in our Upper Provinces and in Peshawur, and in both cases it blows from a westerly point. In Cabul also this season is generally windy, as also in the sign Pisces.

66. Cabul however though at most seasons breezy, is in none remarkably windy, the north and west winds chiefly prevail. The same positions are, I presume, true of Ghuznee, which, however, has less shelter. Kushmeer has been already mentioned as possessing a still climate. The stagnation of air is sometimes very disagreeable, especially to those who have been accustomed to the free circulation in Khoorasan. Other places there are remarkable for continual wind, a circumstance owing to their situation between hills, which by confining the current of air accelerates it. Such is Jummoo, built not far from the left of the Chunab, and some other places of less note. Jellalabad and Koonur have never-ceasing winds, chiefly from the west. These threaten to bury under sand the good lands of the former. In Peshawur and Bajour the prevailing wind during the whole of the summer is said to be the east, and the observations made during the stay of

the embassy in that country correspond to this opinion. In the winter the chief winds in Jellalabad, Koonur, Bajour, and Peshawur, is the west, and next to it the north, which in Bajour is in that season productive of great cold. In Peshawur and Bajour, as in our provinces, are occasional blasts during the spring and summer months; in the former place they blow from the west and south-west.

67. Even in Bokhara hot winds are known, but they are confined to a few weeks in the year, and a few hours in the day, and altogether are little regarded. This is equally true of those in Hirat, but the hot winds of Seestan are severe. Those of Peshawur have been already mentioned (see paragraph 49.) Jellalabad, which on the whole has a cooler climate, has severer hot winds than Peshawur, because of its lying to the west, or leeward of the Bedoulut hills (see paragraph 50.) The wind from them is moderated in its bad qualities before it reaches the city of Jellalabad. Within the tract in which it is generated it is a true Simoom or pestilential wind, and many instances are given of its proving fatal to travellers. On the night of the 21st June, the Cabul Mission experienced a wind of the most intolerable heat; it blew from the low hills on which Attock is situated, then bearing south. The hottest winds appear to proceed from, or blow over, low hills, whose rocks and stones acquire a higher temperature than the soil of the plains. In the warm parts of Bulochistan, hot winds of very great severity blow. Instances are few of their proving fatal, but not unfrequently they scorch the shoulders and backs of travellers.

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### SECTION III.—*Of the Rains*

68. In India from the northern mountains to Cape Comorin, the grand rains are those which beginning about midsummer, continue to the middle or end of autumn. The monsoon of the Coromandel Coast forms an exception, caused by peculiar circumstances. The rains, so called by way of eminence, on an average of seasons begin in Calcutta in the first week of June, in Futthgurh about the 20th of that month, and in the intermediate situations they are later, according as the place is situated more or less to the west of Calcutta. This rule is true in a majority of places and seasons. In our progress westward, it is also found that the rains are more scanty. The annual inches of water in Calcutta, are thrice those in Delhi. It is only in the lower parts of Bengal, that in the same season rains fall in the four successive Hinduwee months, Usarh, Sawun, Bhador, Koonar, of

which the first begins about the 13th of June ; far less can four months be counted in the Upper Provinces between the first and the last shower. Yet is 'Chowmasa' a term for the rains, in the whole of the Bengal provinces. The rains of the first and fourth month are more scanty and uncertain than of the second and third. The second again is more rainy than the third, and its rains more seldom fail ; it begins about the 13th of July. Places in the same longitude have more or less rain, according to their proximity to the great northern hills. This rule, however, does not extend to all places, for those which are near hills of considerable height within India itself, receive from that circumstance more copious rains. It is thus the province of Kuttack is more rainy than even the neighbourhood of Calcutta. Very many places in the Marhatta territories and the Dukhan are far more rainy than those in corresponding longitudes within our Upper Provinces. When other circumstances are equal, the number of inches of water which fall in the year diminishes in proportion as we recede from the sea. Hence Jodhpoor and Oodeepoor have more rains than Beekaneer or Jypoor.

69. The rains of Hindoostan extend to certain points in these countries, and their periods and quantities are according to the laws just mentioned. The rains of Lahour are later, and less than those of Delhi. Those of Pothwar are still more so, and only the two middle months are relied on. One heavy shower in the month of September is of the utmost importance to their crops, but in some years is longed for in vain. In Peshawur only the second month of the rains remains ; nay, some seasons pass in which all are denied. The husbandman, however, sows in expectation of the rain of Sawun. From Peshawur we trace the rains to a termination in Lughman and Jellalabad, where they dwindle to a few showers. It thus appears that they diminish in our progress westward. But this rule is modified by others. Pukhlee, upper Sward, Punjkora, and Bajour, of which the two last are more west in longitude than Peshawur, have, as being hilly or near hills, much more rain than that place. Kushmeer lying to the east of all these has yet but a few showers, for the mountains to the south shut out the rains in this quarter, though we find by Captain Turner's account, that they have not this effect in the part of Tibet he visited. Barah-Moola, lying in the narrow pass leading to Kushmeer from the west, not only has a portion of the great rains, but showers in all the months in the year. Teera enjoys the four months of rain, but the showers are light. It is even said that it rains every day of the year in some part of the plains or the vallies of Teera. To the north the

great chain of mountains does not allow the rains to fall in Kashkur, but the country of the Kafeis has an equal share with Bajour.

70. We have thus traced the summer rains in the high latitudes. In the middle latitudes they extend to all the sources of the river Koorm, being here diminished in duration to less than one month. These showers are generally severe, and important to the agriculture of the country. By the Afghans they are called, 'Vuse,' a term plainly of Indian origin. In latitudes still more southerly it is difficult to lay down the limits. The 'Vuse' certainly does not reach Candahar, but is sufficiently regular at Zhob of the Kakurs. It is said to reach Kilat of the Beeloches, but is not there the chief rain. Nay, it is by one person asserted to be known as far west as Punjgoor. This is rendered incredible by adverting that that place is not very distant from the sea. Natives of Persia assure us that in most seasons there is a heavy fall of rain in the month of August in the province of Laristan; and I presume this is equally true of the coast of Kirman. It is probably the neighbourhood of the sea which gives to lower Sindh a rainy season of greater length than the upper, and perhaps not greatly inferior to that of the upper Punjab, yet has it been known in some years to fail, but the circumstance is of little importance to agriculture. Mooltan, distant at once from the sea and from the mountains, has very little remaining of the rains, less than any part, it is probable, of Sindh or Seeweestan, or the Daman and Makalwad, though lying to the west. Buhwulpoor has more rain than Mooltan. The rains of Beekaneer are somewhat uncertain and scanty, for a country situated on this side the desert. Showers sometimes fall in Seestan during the summer, but they are unconnected with the rains of India.

71. In the Bengal provinces next in importance to the grand summer rains, are the showers which fall in the winter. By the natives this rain is called 'Muhawut,' because the greater part fall in the Hinduwee month Magh, which on an average of seasons begins on the 13th of January. The farmers in what is called the Puharturee, or the tract of country lying at the foot of the great northern mountains, do not even water their rubbee crops, but trust to this rain, which however in some years fails, even there and in many parts of the plains more distant from the hills. The Muhawut extends from our provinces as far as Jodhpoor; but with respect to many parts of India I do not possess information as to whether it occurs or not. Part of the rainy monsoon of the Coromandel Coast coincides in time with it, but far exceeds it in quantity and importance. In the season 1808-9 it failed in our Upper Provinces in general, a circumstance productive of great

loss to the former. Neither did it occur in or near any place where the Mission was, that is between Beekaneer and Dera-Ismael Khan, but in those latter countries the want of it is productive of little or no inconvenience.

72. In the same season it fell abundantly in Peshawur, a province where a great proportion of the rubbee depends upon it; and all the countries now treated of, with the exception to be mentioned, enjoy it with tolerable regularity. It falls according to circumstances in the form of rain, sleet, or snow; and with respect to the time it may be expected, the chief showers are (as in England) rather in the second than the first half of winter. Although the time varies in different years, it is seldom that it fails altogether. The consequence of such a failure is dearth, sometimes famine. Where it used to fall as rain, the crops die from drought, or are killed by the severity of the frost that usually accompanies dry winters; where it used to fall as snow, the crops wanting this protection are exposed to the frost, and the hopes of the spring which partly rested on the melting of the snows in the hills are disappointed. There is a favorite proverb in Cabul, "let Cabul be filled with snow rather than gold." The quantity which falls is very various, according to season and places. The highest and most mountainous places appear to receive most, but this rule alone does not comprehend all cases. In Cabul the number of snowy days in the three months of winter is computed at sixteen. If we may form any judgment from the hints given us in Forster's Journal, this is more than occurs in Khoorasan. In the Punjab this rain is certainly of much inferior importance, perhaps it is of inferior amount, and less certain in its periodical return. But that quarter where it is most uncertain and most insignificant, is the same in which the summer rains are so scanty, and in which the Mission spent the depth of the winter 1808-9 (see paragraphs 70 and 71) being Mooltan, and a certain distance around it. In the Daman this rain is sufficiently regular, and of great importance. In nether Sindh, although of very little importance, it falls in most years. It may be observed that it extends far beyond the limits of the present field, to the Hellespont and the Russian frontier. The same is the chief rain in the north-west of Arabia. In none of the intermediate countries, whether cold or warm, is it lost. It is said to be but scanty in Yarkund, but with respect to many other parts of Chinese Toorkistan we possess little information on this, or most other particulars.

73. The third rain we may distinguish, is that of the spring. It is perhaps the most important of the whole in the countries lying west



of the Indoor, north of its sources ; in all of which it is confidently expected, and fails only in the most calamitous seasons or peculiar situations. In the neighbourhood of Candahar indeed, and the country of the Tureens, it is said to be but scanty, and little rain is looked for after the vernal equinox. The falls of snow and rain in the winter are in these places their chief dependance for the success of such crops as are not artificially watered. The spring falls are not confined to the countries under our view, but north and west, extend to the east coast of Arabia, a part at least of Syria, the Hellespont and Euxine, and the Russian frontiers ; towards India we find them tolerably regular in the middle and lower Sindh, but in the latter they are the less regarded, as they are of little use to agriculture, and in quantity inferior to those of the summer. In the upper Sindh and in Mooltan respectively, the summer and spring rains are perhaps equal. In the year 1809, some considerable spring showers fell in Mooltan, but in ordinary seasons this, like the preceding rains, is there but scanty and uncertain. In Peshawur, Kohat, Malgun, Fesakhel, and Bunnoo the spring is the chief rain of the year, the same is true of Chhuchh, Huzara, Kushmeer, and perhaps Bukhlee, but in Pothwar it is exceeded by the summer rain. We have seen that the latter diminishes as we proceed westwards. The spring rains, on the contrary, diminish as we proceed eastwards from Peshawur. This law however is modified by others ; and those of Kushmeer, as being a country embosomed in hills, are more abundant than those of Peshawur. It is difficult to fix the eastern limits of this rain. Within the great northern mountains, and to a certain distance from their foot, it seems to extend in ordinary seasons even to the banks of the Burmphotoor, but in the plains of India nothing remains of it but some thunder-storms accompanied with showers.

74. Within the limits in which it is regular it is more or less copious, according to the season and place. Cabul receives more than Peshawur or most parts of Khoorasan, and Fyzabad more than Cabul. In Budukhshan, Durwaz, Keerategin, and the east of Toorkistan it is very abundant, but in Yarkund very scanty. In different places as well as in different seasons, there is some diversity in the season of this rain, but it would be tedious to enumerate instances. In general most rain falls in the month of March, but in some cases the heaviest showers are at the end of February or month of April ; rain in the month of May in most of these countries is not to be considered as part of the spring rains, but rather as accidental, and indeed unwelcome. In May 1806, there fell in Cabul a heavy rain which did much damage. Where

fruits are cultivated to a great extent. Rain in the summer is much deprecated, yet in some parts of Toorkistan showers are neither uncommon nor unwelcome even in the end of May. Generally speaking, May is a dry month in the countries under our view. June too is dry, and where the rains of Hindoostan extend, the hottest. The heat declines in August in both descriptions of countries. August is in Peshawur a cloudy month, not a rainy, and is dry in all the countries west of the Indus, as is September. October is a dry month both in India and in these countries. In high and mountainous situations snow begins to fall in November, but the chief showers are in December and January.

75. Dews and mists are often little less important to the husbandman than rains. They do not here attract much attention. They are commonest in the autumnal months, or the beginning of winter, and in the warm countries especially, if well watered and of a humid soil. Mooltan and Sindh to the south, and Peshawur to the north, seem the most noted for mists. The dews of Peshawur in August, September, and October, are said to be heavy. In September the people are induced from fear of the effects of the dews, as well as from the chilliness, to cease sleeping on the terraces. The spring there is more dewy than in Hindoostan. With respect to clouds and overcast weather, the cold countries have more than the warm. The atmosphere of Kushmeer is cloudy during a considerable part of the year; May and June are its most sunny months, but in July, when it begins to rain in the Punjab, the clouds extend to Kushmeer. In the cold countries in general, clouds are observed to gather from the beginning of October, preparatory to the snows, which are to follow.

76. On the whole the vast tract here surveyed must be pronounced to have a dry climate, whether we regard the quantity of moisture which falls in the year, or the number of rainy days. The districts which can be called humid are comparatively few and unimportant; the rains even of our Upper Provinces astonish the natives of Afghanistan. The spring rains are the chief in Peshawur, and the season 1809 was a favorable one, yet were there but seven days of heavy rain, and four of light. It would be difficult to form an accurate scale of the dryness and humidity of the various districts already enumerated, but a conjecture may be formed from the data already given. Khoorasan is on the whole drier than those parts of Afghanistan not included within it, or than Toorkistan. Bulochistan is undoubtedly a dry climate. The west of Toorkistan is far drier than

the east or south-east. Budukhshan, Durwaz, and Keerategin Budukhshan are more humid than Cabul, as is Kushmeer. The humidity of Kushmeer adapts it for the production of rice, which however is there raised chiefly by artificial watering, and ripens in the drier part of the year. The dry and sunny summer of Cabul is favorable to the delicate fruits of the cold and temperate climates, which are here cultivated to a great extent and with much success, but in Kushmeer the apple only can be commended. Within the limits of India there is no place perhaps where less rain falls, and that little so irregular, as the neighbourhood of Mooltan. This however is little regarded by the farmer, who waters his khuruf crop from wells or canals drawn from the river, and raises a proportion of his rubbee on the moist lands which in the cold season the river has abandoned. Nor does the scantiness of the rains imply a dry air. Mists have been already mentioned as common there in the winter.

77. Having now mentioned in succession the altitudes of the mountains and their course, the slope and conformation of the land, the sources of the rivers, the heat of the climates, and the periods and quantities of the rains and snow, we may proceed to deduce from these facts in combination the periods of the rising and falling of the streams and rivers. Few considerations are more important to the farmer and the traveller, or to armies.

78. In perfect plains in a warm climate we rarely find constant streams to originate. The rains of such countries though copious, are violent and of short duration. During the greater part of the year no moisture falls. The rains of the rainy season are drained off with a rapidity corresponding to their violence and their short duration. In their passage they cut deep channels which are dry during other parts of the year; such are very numerous in India, and are by us called dry nullahs. After rain they are always inconvenient to travellers, sometimes dangerous. Where they afford a level higher than the neighbouring ground under tillage, they are not without their use in agriculture, for by a little pains the water they discharge may be turned upon the fields. The Afghans are very sensible of their value, and reckon lands situated so as to be watered from them next to those which can be watered from constant streams, and superior to such as receive no water but what falls on their own surface. A dry nullah is in Pushtoo called '*Khever*,' and in the Hindhee of Peshawur and the west of the Punjab, '*Kus*.' Even low hills in a warm climate usually give out but temporary streams. The snow which may fall on them soon melts, and the

springs which are found in them do not generally give out water. It is therefore plain that the periods of such streams as may originate in them must be the same as those of the rains and snows of the country; such are often of the greatest importance to the husbandry of a little neighbourhood, but their fame does not pass beyond those bounds. The Swan and Huro alone of this class are deserving of mention. They seem to have no periods distinct from the rains in the country, but their springs are sufficient to preserve them running streams at all seasons until they gain the Indus, whereas most others lose themselves, or are expended on the fields, in all seasons but the rainy, and some do not in any season reach the sea or a river.

79. We every day hear of mountains so lofty as to be covered with never melting snow. The expression construed in strictness would lead to an erroneous conclusion, for, that ice or snow can only remain unmelted which lies in a place whose temperature is never above the freezing point, and few such can be found within the habitable climates. Snow gradually disappears even during a hard frost. Part it is true, is carried off by evaporation, but part also is melted by the heat of the earth. The rivers of Switzerland rise from under glaciers of solid ice. As the inferior snows are gradually melted away, part of the upper also deprived of this support, either gradually slide down the declivities, or fall in avalanches, themselves to be melted in lower and warmer regions. The snow and ice are therefore perennial only because they are supplied from time to time as fast as they are consumed. It is also evident from the same principles, that the fall of snow in winter must in all cases have some tendency to augment the streams, since part is forthwith melted by the heat of the earth. But where these streams originate in hills of considerable altitudes, a far greater part is as it were stored up for a warmer season, and according to the degree of that altitude, and the cold consequent upon it, the season of its melting is later or earlier. While the snows of the low hills are rapidly melting by the warmth and the rains of March, it is at the same time snowing on the high mountains, whose previous stores are as yet unaffected by the weather. The increasing heat at length dissolves them in the order of their altitude, the highest of all melting at midsummer. It is therefore evident that as far as depends on the melting of the snow, streams rising in low hills must be highest in the spring, and streams rising in high hills in the summer; and the periods of the streams would thus be an index of the altitude of their sources. But when a river is fed by the snows of both high and low hills, we

cannot thus decide without adverting to other circumstances. If the low hills be extensive, the flood they occasion may surpass that arising from the melting of the high snows, under which are situated the uppermost sources of the river. If the river be highest in summer, we may decide that it has lofty mountains at its head. This conclusion however is just only when we put out of view the periods of the rains, and decide from those of the thaws only. Both considerations must be combined in our judgment in particular instances, to which we now proceed.

30. The periods of the Indus and the rivers of the Punjab are nearly the same as those of the Ganges and its tributary branches, which are lowest in the winter, rise somewhat in the spring, and are highest in the middle of August. The rise in the great Ganges is perhaps gradual, certain, and nearly of the same quantity in different years; for being fed by many streams one chance and anomaly corrects another, but the same is not true of its branches, including the upper Ganges itself. The annual rise at Hurdwar is six or seven feet; in the lower part of Bengal above the influence of the tide, it is thirty-one. This difference, may I believe, be shewn to be a consequence from the general principles of hydrostatics; it must therefore be supposed to exist in the case of the Indus and its branches, for they also run in a champaign country and yielding soil. My inquiries tend to confirm this opinion. After rains of uncommon severity the rivers of the Punjab sometimes rise to a great height; the effect however is temporary, and many seasons pass in which no such extraordinary floods occur. The great Indus after the junction of the Punjnuud is from various causes less affected by local and temporary circumstances, but its regular and annual rise is greater than that of any of its branches. The branches have diversities among themselves not reducible under one general rule, but caused by special circumstances. The Ranee, which is the least of all the rivers, had yet in 1809 a rise equal to any of them. When other circumstances are the same, streams which run in sand increase more in breadth in their flood season, and those which run in clay increase more in depth. The annual rise of the great Indus I reckon about sixteen feet; that of the Ganges is thirty-one; and of the Nile twenty-four. The proportion in which their waters are respectively increased it would be more difficult to estimate. The same causes combine in the raising the Indus and its branches, and the rivers of our provinces—that it both thaws and rains. The effects in this respect are different, in that there is no inundation in the Punjab or Sindh, for we cannot apply that term where the tracts covered

are insignificant in proportion to the whole surface. The character of the Punjab is different from that of Bengal or Egypt. Instead of the banks of the river being higher than the remoter country, the various Doabs usually slope from their interior towards the rivers which bound them. Low tracts are sometimes found, which after heavy rains are covered to some depth with water; but there is no general inundation derived either from rain or from rivers, as in Bengal. The surface of the Punjab, however, after excluding the country beyond the Hydaspes, is lower above the level of its rivers than that of our Upper Provinces in general, with respect to the rivers which run in them.

81. The periods of the Cabul river where it joins the Indus are nearly the same as those of it. It is lowest in the winter, notwithstanding the rains of that season in the valley of Peshawur. It is sensibly affected by the spring rains in February and March. It falls after they have passed over, yet not to its level in the winter, for now the snow of the lesser hills begins to thaw. At the end of May the middle snows begin to descend, and after them the upper, which bring the river to its greatest height at the beginning of August. We are to attribute the effect in part to the rains, which fall at that period at some of its sources (see paragraph 69.) Such is the history of the grand streams, but there is a diversity of circumstances with respect to the branches composing it. The Pech river swells early in spring, and declines from about the 28th of May. The Punjkora river follows nearly the same laws, though indeed heavy rain in the months of July or August will cause it to reach its greatest height in those months. The three streams in the valley of Cabul (see paragraph 36), the Lughman river, the Kashkar, and the Swad, with the rivulets of Jellalabad are highest in the month of July or August. The Bara is on the whole the greatest in the spring, but it rises and falls very suddenly, and very often according to the occurrence or cessation of rain in Teera. The To is probably greatest in spring; the Koorm is greatest in July or August, when it is swelled both by the *Vuse* (see paragraph 70) and by the thawing of the upper snows. The Gomul is perhaps the highest at the same time.

82. The diminutive streams of Bulochistan and Seeweestan are in general highest in the spring. The same is true of those found in the western Khoorasan, the Turmuk, and the little streams of the Kakna, Tureen, and Burch countries. Even those rivers which taking their rise in the Paraparnisan flow into Khoorasan, reach their greatest height during the periodical spring rains. The Helbund only which

rises in the most elevated part of that ridge continues to increase after that period. It perhaps reaches its acme the first week of June, but I have received contradictory information on the subject. The Murghab, and whatever streams are found in the Jumsheedee country, in Mymuna, and Undkho, may be presumed to be highest in the spring.

83. The Oxus and Jaxartes, and all their remaining branches which have been enumerated in the introduction, including the streams of Bulk, rise in the spring, but are highest in the summer, notwithstanding the draught of that season. Some of the subordinate streams are higher in spring than in summer, but they are considerable enough to impart the same character to the principal ones into which they discharge themselves. With respect to the Neelum, and the rivers of Chinese Toorkistan, we know little beyond their names. From circumstances it may be conjectured that they are higher in summer than in spring.

#### SECTION IV.—*Of Salubrity.*

84. I am able to offer but a few detached observations on this subject. Its importance induces me not to pass it altogether in silence, although my opportunities have been small, and its natural difficulties are very great. There are few subjects on which opinions are so contradictory, and so many regular prejudices prevail. Medicine is at a low ebb in the country, and its professors entertain many absurd opinions respecting the original causes of disease, most of which they deduce from the qualities they attribute to different species of food, paying little regard to the operation of other causes, which among us are considered as the most palpable and powerful. The doctrines of Avicenna are much followed, especially in Toorkistan. Physicians in these countries are not liberally rewarded, and many are obliged to travel from place to place in pursuit of a livelihood. These are chiefly natives of Peshawur and its neighbourhood, and their travels are principally confined to Toorkistan, which they visit on the opening of the spring. Few or no natives of Toorkistan or Khoorasan pass into other countries with such views. Some of these itinerants add the practice of the *ruml*, and other occult arts, to their accomplishments. They traverse great spaces, and being everywhere welcome, have the best

means of observing the manners of the people, as well as the nature of the country. Accordingly there are found among them many who are stored with curious and useful information. In their own profession they seem to be judicious, according as they have more or less discarded the absurd theories of their books, and proceeded on their own observations, and the practical remarks current in the quarters they have visited. Although surgery be on the whole in a low state, there are some operations which are here performed with great judgment. There are parts of the country in which continual strife prevails, and wounds are generally received, and yet scarcely one professed surgeon is to be found.

85. The Cabul Mission left Delhi on the 12th of October, 1808, and arrived at Beekaneer on the 5th of November. During its stay there many natives of the escort and camp followers were buried. This was not attributable to the unhealthiness of the place or season, but to some preceding circumstances,—severe marching in sand, bad or indifferent water on the route, and great vicissitudes of heat and cold between day and night in the month of October; but, above all, the incautiously eating water-melons and drinking water after heat and fatigue. In passing the desert some individuals were affected with *Nyktolopia*, but by proper treatment they speedily recovered. Diseases in Buhawulpoor, Mooltan, and Dera, and Ismaul-Khan are generally the same as those of our provinces, with the addition of eye complaints, which are comparatively rare in them. Coughs and catarrhs are common in Buhawulpoor. The natives of the detachment experienced during their stay in this country, a cold somewhat greater than that of their own. In the march to Peshawur they were exposed to severe rain, cold, and fatigue, combined. In Peshawur they were but ill accommodated, and exposed to heat and closeness, yet during all this time they were never unhealthy. They marched through the Punjab during the rains, a circumstance which far from being unfavorable, probably preserved them in greater health than they would have enjoyed if halted; there is therefore no reason to conclude the countries they passed through to be unhealthy for strangers.

86. The water of the upper Punjab indeed, is celebrated both by natives and strangers, and the climate vaunted as remarkably salubrious. This boast is not altogether unjust, for here we find but little of the eye complaints so common in similar climates to the west and south. The Sikhs seem a healthy race, and there are found among them some fine persons and faces. They appear built, however, more for activity



than strength. They do not accustom themselves to foot service, and probably could not undergo great fatigue except on horseback. This is still more true of the natives of Toorkistan. Such is the plenty of horses in that country, and so much are they reckoned a necessary of life, that even beggars travel on horseback. The natives of Khoorasan have a great aversion to foot service, and do not excel in that species of travelling, in which the natives of India are generally acknowledged to surpass all their western neighbours. This is absurdly attributed to their foot, when it can be more naturally deduced from the state of their country and their mode of life. Among them none are equal to the Bhutties, or people of Bhutner, where there are said to be some who will travel 30 kos, and after robbing a village or a caravan return the same distance without halting. The people of Hurreeana are in this respect somewhat inferior, but are a robust nation, and in bravery surpass all their neighbours. Being now under our Government, it behoves us to consider how we shall make use of these qualities, or at least prevent them from being turned against us by an enemy. The hill tribes among the Afghans, and others, excel in climbing and in travelling among mountains. The Khyburees are employed in hill warfare as far east as Kot-Kangra, which is situated near the right bank of the Hyphasis before it leaves the mountains; but the Kohistanees are reckoned to excel all others in such operations, and have been known to fight well even in the plain. It is a common observation in the country, that the inhabitants of hills make little figure in war when they venture into the plains, and during the late broils more than one instance has occurred to confirm it. None is more striking than the defeat of Shooja-ool-Moolk, when in the spring of 1802 he brought a force of Khyburees against Peshawur. It is said their inability to bear the heat of the climate was the chief cause of their discomfiture, which terminated in many of them dying of thirst. The natives of the cold and temperate climates express the utmost dislike to the summer heat of that of the warm, but their impatience under it is not always in proportion to the coldness of their native places. The Cabulies support it better than the hill Afghans, or even the Dooranees, whose climate is much warmer than Cabul. This part of the Dooranee character has been very manifest in their history, and productive of important effects. The Persians, though inferior in courage, excel them in steadiness, another good quality of a soldier, and bear the extremities of heat and cold with equal patience. The poverty, ingenuity, and enterprising disposition of the Kushmeerees annually disperse considerable numbers of that nation

over the greatest variety of climates ; and in pursuit of gain, they seem little to regard the heat or cold to be endured.

87. The natives of the warm climates do not manifest the same impatience of the winter cold climates ; on the contrary, Cabul and Kushmeer are the theme of their praises. It seems doubtful whether this quality of the warm climates, by which those born in them are adapted to both species of climates, can be brought forward more in their commendation, or as an argument of their being plainly inferior to the others. It will be found generally true, that in cold climates there are more numerous diseases, perhaps more unhealthiness ; but the natives are more robust and enjoy longer life. In these countries it is remarked that the hair sooner turns grey, and life is shorter in the warmer districts ; eye complaints, moreover, are most common in them. When known in the cold, they usually proceed from travellers having exposed themselves to the glare of the snows ; but the summer is the season of this complaint in the warm districts. Even those patients in whom they have become chronic, feel a remission of their pains in winter. The natives have no rational theory to account why they are more prevalent in some warm countries than in others. Because they affect moist districts rather than dry, these theorists maintain them to arise from the eating of rice, not adverting that they are not peculiarly severe in Kushmeer, and that there are places in which, though rice be the chief food, they are rarely known. It is a singular fact that ophthalmia begins to be common where the summer rains of India become scanty and uncertain. I am inclined to be of opinion with Volney, that it is caused by the dews and breezes to which those who sleep on the terraces expose themselves.

88. Fêver is an universal complaint. Fevers are most common at the equinoxes, but those of the spring are generally of the hot species, where agues and low fevers prevail in the autumn—which, on the whole, is the unhealthiest season of the year. The former species of fevers are commoner in the cold than in the warm districts, and the reverse is true of the latter. The effusion of cold water in the paroxysms of hot fevers, though practised in Persia for ages, is here unknown, except to the Kafirs. It is a general practice to take purging medicines and to draw blood in the spring. Under another subject (see para. 51 and 58) a few places have been mentioned as unhealthy ; there now remain very few to be added. There are many diseases in Kushmeer, a fact less owing to an unhealthy air than to filthiness, poverty, and the degraded condition of the inhabitants. The Kashmerees are at the same time

a robust race, and excelled by none in carrying burdens over mountains. The Huzaras and Oozbucks, especially the former, are broad in their persons, and strong. The water drawn in the interior of Cabul disagrees with strangers, and there is a good deal of sickness among the poor by reason of their being ill accommodated, and the town too closely built, otherwise the climate is not unhealthy, and Peshawur is not inferior to it. Scrofula, a complaint little known in India, is not uncommon among the Daoodzyes, and some other tribes.

89. Khoorasan is undoubtedly a healthy country; and in Toorkistan we can name only a few situations which deserve to be called unhealthy. The most remarkable is Bulkh, which is afflicted with eye-complaints, all species of fevers, consumptions, the Guinea-worm, dropsy, and many other diseases; yet some of its villages have a good air. The most remarkable complaint of Bokhara is the Guinea-worm, which appears in some other situations in the east of Toorkistan and Bactria, in some villages of Candahar, in certain parts of Huzara and of the Pahar-turee of our provinces (see paragraph 71), in Hureeana Haroutee, and many other quarters of India. In all cases it is commonly ascribed to the quality of the water. In Toorkistan the inhabitants of those cities in which it is most prevalent drink from tanks, the water of which is only occasionally renewed. Where running water is to be had the disease disappears; yet I have heard it pretended that there is something in the air of Bokhara which occasions it, and a pleasing story is told of a certain Moolla who was sceptical in this particular. Being persuaded the water only was to blame, he resolved to use none but that of water-melons, and confidently expected to escape; but before he had passed a year in Bokhara he had a number of worms extracted from his body. The only other local complaints deserving of mention is the Goitre, which is now supposed to be the consequence of drinking water impregnated with certain minerals; it is not unknown in Bactria, but its chief seats are the banks of the Kishun Gunga, Sirn, and Pech. The waters of the Uba Seen have somewhat of the same bad quality, and Goitres are common in certain parts of the Gukhur and Khatir countries. It is asserted, that on the banks of the Pech even the dogs and tame birds are affected.

*(To be continued.)*

ART. II.—*March between Mhow and Saugor, 1838.*

Many of the places visited in this journey, were unavoidably visited (it may be almost said) at a gallop; the descriptions are not therefore offered as minute and faultless details, but rather as sketches claiming every indulgence; whose aim is to stimulate the curiosity of future travellers over the same ground, who may have more leisure to pursue the inquiry. Some apology seems also necessary for the digressive nature of the notes. Their best excuse will be their proving either interesting or instructive. Nothing was observed worth noticing till the fourth march,—unless we except a warm spring\* between Duttoda and Oouchade, known by the name of the “Kiaura Koond” from a few of the so-called trees, whose flowers perfume its banks, and which give a title to a Ling temple near it, “Kioureswar.”

Some time after leaving Akberpoor, the road crosses a range of low wooded hills, issuing from which the small village of Kurnawud is seen, half-hidden in foliage on the right. It boasts itself to derive its name and origin from one who plays a conspicuous part in the “Bharut,” the ear-born son of Kunti—the 6th Pandoo—the gallant and generous Kurun. Not content with the wonderful adventures of which he is the hero in “the great war,” the inhabitants of the vicinity possess a goodly store of silly local *cheritras* regarding him, which they eagerly recite, and believe with perhaps a more lively faith, than will elicit from them the more orthodox, but less familiar, fables of Vyasu. One of the legends they told us, was that which is found in Conolly’s overland journey,† and the others were of a like stamp. A Ling temple close to the village, honored by the name of the hero, appears—the lower part of it at least—to be of considerable antiquity; though a plastered roof now covers the Subha, and a modern brick dome supplies the place of the doubtless once pyramidal Sikra; the

\* Springs of this kind are not uncommon in the offsets of the Vindhya. They rarely are of higher temperature than 80°, and have no remarkable chemical properties.

† Vol. ii. page 286. The story is however not in the Bhagawut. It may possibly be found in the “Kurun Upakian.” A Basha poem, the “Gurb Chintamani” describing the inconstancy of human glory, thus speaks of Kurun’s charity, and his end, in popular doggerel—

|                       |                              |
|-----------------------|------------------------------|
| Raja Kurun bihoto     | Death has seized as his prey |
| Kunchun khatma deto   | Kurun, who lavished gold;    |
| He nur murgya chun me | Like a spark he passed away; |
| Dera kuryya bun me.   | His grave is in the world.   |

fragments of which lie scattered around. Among the ruins may be observed a mutilated horse and rider, which perhaps represented Raja Kurun and his steed; a large female bust with three faces; and a head, the size of life, (we searched and inquired in vain for the trunk), having the thick lips and curly looking hair of a Buddhist or Jain saint. The latter we incline to believe, since the Jain faith, as will be presently seen, was formerly very prevalent in this neighbourhood, and no traces of Buddhism were observed; unless the *trimukhi* be assigned to that sect,—as are by some,\* the celebrated *trimurtis* of Elephanta, &c. An Indian Budh too, may generally, (perhaps not invariably,) be distinguished† from that of a *Tirthankur* by its more elaborate ornaments.‡ There is usually on the crown of the first, a knot which resembles hair collected into a knob; but this knot is often changed into an ornament, evidently attached to a cap.§ probably in some cases made of hair; and which, fitted tight to the skull, covering the bald shaven head, with which Budh priests are so often twitted by Hindoo dramatists.|| Thus in the “Prabodha Chandu Udaya” (see Wilson’s Theatre) Soma Siddhanta calls the Budh, “thou uncombed one.” The Budh head-dress is indeed most changeable; but the Jain twenty-four are almost invariably imaged, wearing only the non-increasing locks which forms one of their *atusyas*:¶ these, they are

\* Quar. Oriental Journ. No. 14, page 219. Several female *trimurtis* are figured in Raffles’ Java.

† There is seldom any difficulty in deciding whether a perfect image is Jain or Budh, though some of the tests recommended are of questionable value. Wilson says, As. Rs. 16; 457, “It is more common to find Jain pontiffs shaded by the snake.” Now, though many Budhs, (T. R. A. S. 3; 481—As. Rs. 16; 458 plate—Crawford’s Siam, 109—Davy’s Ceylon, 468, &c.) and inferior Jain deities, are thus snail-tored—Parusnath alone of the Tirthankurs is shaded by the Nag; and even he is sometimes represented without the hood,—the snake being merely carved at his feet, as the *Sanchun*, or distinguishing mark. Perhaps one of the best tests is the “Sri Butch,” which (here at least) is carved on the breast (butchus, the chest) of every Jain image. We have never remarked this symbol so placed on a Budh statue.

‡ Prinsep says the contrary (J. A. S. 5; 485), but the Budh head-dress is not certainly “simple.”

§ See the drawings of the Dhyani Budhs, Bombay Trans. vol. 2; or As. Rs. vol. 16.

|| The shaving of the head among the Hindoos was infamy, As. Rs. 17; 616. That Budh was shaved, we may judge from the curious pantomime practised in Ceylon, Davy 125. Among the living representatives of the saint there would appear to be no fixed rule, as in Du Halde, vol. 2, one Sama is described as having the head shaved, another with curly locks.

¶ A. R. 17; 247, In the only list of *atusyas* at hand, that in the Sri Pal Cheritra, the curling of the locks is not included. Wilson’s authority was probably different

often described in their Shastrus as pulling out by handful : and some Jain pundits have even assured me, that what appears like hair on their statues, is not intended to represent hair, but the naked scalp thus forcibly deprived of it.\* Jain saints, however, like the Budhs, sometimes wear a *mookhut*.

On a pilaster to the right, as you enter the temple, is a rudely cut inscription, from which it is to be feared but little light will be thrown on the history of the place ; as it merely records, and that indistinctly, the grant during the reign of the liberal and wise Deva Pal, of ground for twenty temples to one Yusheek Pal. The date, A. D. 1158, is a dark period in Malwa history : and Deva Pal, whose name is not to be found in the list of kings, was probably some petty chief, who in those days of anarchy and confusion, raised himself to temporary consequence in this wild part of the country.

Peeplia, three miles from Kurnawud, contains no antiquities, and but one place worth visiting—a Digumbir Jain temple ; which as the place is under the tolerant rule of a Rajpoot, (the Raja of Baglee), occupies a conspicuous position in the Bazar, instead of being concealed, as in a Mahratta town, in some obscure alley. It may be here noticed that from this to Saugor, the Jains are chiefly Digumbir, consisting, for the most part, of Pudmavati Pwawurs ; which Ginatt† is entirely of that class. Switumbirs, as elsewhere remarked, are more commonly met with round Ougein.‡

From Peeplia a road strikes off to Hoshungabad, and the report of antiquities at the first march induced us to deviate so far. We found

\* Modern Jain priests, as far as I can learn, have no fixed rule of wearing their hair. They generally shave it in front, and allow it to grow long behind. But Dhoondias, Soomegis, and a few Gooroos and Juttes eradicate the hair, though not in the Panch Mooshti fashion of their ancestors, only plucking them out occasionally, as for instance once a year, tenderly, and one by one. Budh priests have, if I mistake not, in all countries always shaved their heads, Davy 296, 210, 219. Carous, Japan, Crawford, Mandens, M. Polo 253 and note. When a Jutti adopts *achela* he shaves all the hair off the child's head, except one lock, which it is the Gooroo's part to pull out (*lachun*.) The Digumbir sannyasis of the south never shave A. R. 9. 284.

† **गीनात** So vulgarly spelt and pronounced. Miles writes the word *Nat* : Tod, *Nyat* : Sanscrit **जाति**.

‡ That is taking Ougein as a centre, and giving the circle a radius of forty miles ; but north of Ougein, Visnoot Buniahs outnumber the Jains. From Rutlam the Digumbirs begin to increase ; and from Banswarra to the Aravulli, hardly any other tribe is to be met with but Digumbir Hoomurs. Guzerat, Marwar, and north Mewar are the chief seats of the Switumbirs.


however, only some Jain statues, eight or ten feet high, a few lying in the miserable village ; the best on the top of a hill, which overhangs it. The temples which once sheltered them, of which there were the ruins of three or four on the hill, have long been thrown down ; but we could calculate their age with sufficient precision ; for, though the weather-worn inscriptions on the plinths of the statues were illegible, the date 11th or perhaps 12th could be traced. We made out but one *Sanchun*, the deer of Santinath.\*

Whether these images are Digumbir or Switumbir, it is impossible to say, for all statues of the twenty-four are Digumbir, or at least naked. Some Switumbirs indeed pretend that *their* statues may be detected by a string (Kundora) round the loins—a doubtful proof, since the wrinkles of the belly are very likely to be mistaken for it. All,† whether Digumbir, or Switumbir, have as before remarked, the *Sri butch*,‡ with which mark the future Tirthaukur is said to be distinguished at his birth. In fact there is not any positive distinction between the undressed images, as is proved by some of them—the celebrated Rikhabnath near Doongerpoor for instance—being claimed by both sects. Tod's remark (Raj. 2 ; 744) which seems to argue the contrary, may be safely taken as a flourish.

Though the antiquities of Bijwar proved so little interesting, the excursion was altogether pleasant enough. One of our party, a Jutti, was in high delight as we neared his native place Baglee, which he had not visited for twenty years, though he had been all that time at Indore. It was amusing to watch the eagerness, with which he recognized every old hut, mata, or tree, to most of which some

\* The Sanchun is frequently omitted on old Jain statues, and sometimes, but more rarely, on modern ones. In such cases the saint represented must be guessed at.

† It must be confessed, however, that the Digumbir figures As. Rs. vol. 9, are without it.

‡ The *Sri butch*, which is generally painted as a flower, but carved on an image as if a square  is one of the Jain Asht Mungliks, or eight auspicious symbols, which slightly differ from those of the Budhs. As. R. 16, 460. They are represented in drawing (A.) a copy from a small brass table, sometimes placed before a saint, as a kind of altar. It was picked up by me at a fair, from the miscellaneous rubbish of a Bohra's shop, and may have been plundered from some old temple. At the back is scratched the date 1167. The signs, according to the Jiva Bhagawut Sutra, 3rd Kund, are the,—1st Swastica,—2nd Sri Butch,—3rd Namdivertha,—4th Censer,—5th Throne,—6th Kullus, (or water) —or 7th the Fish,—8th Looking-glass. The Sri Butch occasionally carved on images of Krishna seems somewhat different from the Jain mark,—if indeed I mistake not in supposing the former to be synonymous with the Briguluta, As. R. 16, 161 ; Prem Sagun 88.

tradition was attached, or a story of the bad old times of the Pindaries. He shewed us, *inter alia*, after much searching, an old Mhowa tree by the road side, the hollow trunk of which was full of water. This he challenged us to empty. "Fill your lotas," he cried out triumphantly, (for we had often before received rather incredulously his tales of this very tree) "fill your lotas all day long, and there will still remain a cupful for the next comer." As the water is sweet, and the hole covered, a spring perhaps rises under this new species of *Arbre voyageur*. A similar reservoir is described in the Journal of the Bor Khampti expedition.

The Raja of Baglee honored us with a visit, and finding that we were curious in such matters, gave a short sketch of his history, and desired the Kool Gooroo, to extract from his papers, any thing they might contain regarding the family. The Raja would seem from his putrali to be a Champawut\* Rahtore. We could not learn the date of the emigration of his ancestors: and indeed the history of the family is but a barren list of names, till we come to Kakul Das; who, in the middle of the last century, served with a few followers under the Bhopal Nawaubs.

The popular account, of how the strangers first obtained land, appears more romantic than probable. The Nuwaub stuck some very small object, (tradition says a peppercorn,) on the top of a pole, and offered a reward, for whoever should knock it off, without hitting the pole. All having failed, Suktawut Gee, the wife of Salim Sing, the youngest son of Kokul Das' four sons, stepped out, and at the first shot performed the feat: for this, the village of Bamun Kheri was given to her in enam. Baglee, three coss from Bamun Kheri, was at this time in the possession of a Chohan Grassya, named Banki Rao; who instead of attending to his interests, amused himself daily with boating on a tank, about a mile from Baglee, called the Koomptalao. Salim Sing, taking advantage of this negligence, attacked and took the fort, while its master was absent; and though the expelled chief made one desperate effort to recover it, he was driven back, and the Rahtores have ever since kept the place.† To confirm their power they

\* The Gooroo's tables commence with ten names prior to Jya Chund, the last king of Canoge; none of which, except the penult have any resemblance to those in Tod's list, or in the new lists elicited from coins, &c. Two princes, Birda Sing and Jutaran, connect Jya Chund with Seoji; from whom, to Rinnull the names, (allowing for provincial spelling,) strictly correspond with Tod. After Rinnull, comes his third son Champa, from whose time, the catalogue is evidently defective,—seven names occupying a period of more than 300 years.

† The turned-out Grassya's family still reside, I am told, at Mukhsi, a celebrated Jain Tirth near Ougem, and receive through our mediation some small annuity.



offered themselves as tributaries to Scindia, and with the usual activity of new settlers, soon cleared away large tracts of the forest ; so that when we came to the country, about sixty years\* after the first conquest, they were lords of as many villages. The present Raja, Bheem Sing, is the son of Salim Sing.

From Bijwar, Ashta may be reached by a difficult pass over a range of hills of considerable height. At a village called Magherda, half way, a few handsome Jain statues have been collected and enshrined in a low walled court, some fourteen feet square ; where they are worshipped by the ignorant piety of the villagers as *matas*. The court we should have supposed to be a “ *bettu* ” (A. R. 9 ; 285), did not that description of temple seem to be peculiar to the Jains of the south. On one of the stones of the wall, there was an inscription in modern Nagari. It was placed at an inconvenient height, and as we were pressed for time, and it evidently contained no date, we did not copy it. The image, which misled the inhabitants of the village, was doubtless a Pudmavati ;† who occupies the principal place, while Santinath and some other saints, sit around her ; nor could the rustics be expected to know whom this figure represented : for, as is worthy of remark, the lesser Jain deities are rarely to be found amongst ancient ruins ; inducing the belief, that their admittance into temples is a modern innovation.

The name of “ Deo Burno,” the Hill of Gods, and the hope-inspiring intelligence of a large “ Kumbh,” tempted us to make a run from Ashta to a village named Belpa, about fourteen miles north-west of it, and situated close to the boasted Tiruth. On this spot we were assured we should literally find one mass of deities, “ *tantum statuarum ut alter populus Japidens videretur* ”—and to give us some notion of the number of the images, (many of which were said to be milk-maids, turned into stone while milking), they borrowed a fable very popular at Kasi ; where you are told that one maund of rice will not suffice the worshipper, who should wish to drop only one grain at each shrine.

\* The exact date of the taking of the fort we could not learn ; they said the beginning of the current Sumvut.

† Pudmavati you are acquainted with from a notice in the T.R.A.S. but of the forms and legends of the numerous *Dii minores* of the Jain Pantheon very little seems to be known. It is however very necessary to be *au fait* on these subjects before visiting Jain temples, as they are frequently covered with mythological paintings. I had proposed giving some account of the more common ones, but fear I must now abandon the design. They might possibly have been useful in decyphering the ancient Budh paintings.

Of course this report, like every such report, was fabulous. All we saw on the hill, were a few Vishnooli ruins, temples, and broken statues; some of the latter however exquisitely carved. The supposed milk-maids we found to be a mutilated group of Dytes and Deotas churning the ocean, with mount Mundar and Vasooki. The only temple at present in preservation, or hallowed, is a cave,—from the floor of which, a languid spring issues, filling a small square tank built about it. The water was muddy and not drinkable: but the fount, we were told, sometimes supplied a sweeter beverage,—the pilgrims who assemble here once or twice in the year using no other. Some of the sculptures of the cave, (now sacred to Sheo,) perhaps indicate that it had once been dedicated to Vishnooli,—a very common metamorphosis in South Malwa, seeming to prove the priority of the latter worship in these parts. The Kumbh was merely a large Jain statue at the foot of the hill.

At a village called Gundawul, about five coss from Belpur, there are several ruined Jain temples, two or three large Jain images, called here by the deceptive name of Kumbh, and a Ling mundir, in which stands an image of Gundrub Sein in his human shape, with an ass's head; there too Vishnooli seems formerly to have reigned, from the sculptures of the Autars about the temple. These places are worth visiting, were it only for the fine bur trees which luxuriate in every village.

The sight of these was the more pleasing, in consequence of their scarcity in the higher ground about Mhow; whilst in this neighbourhood they are remarkable for their size and beauty. In the latter quality, one at Newri is said to bear the palm; and another at Untralo near Ashta is very celebrated—but the largest forms the boast of Belpur; though very lofty it already covers a space of 400 paces, and will doubtless spread much further—for remarking that it had encroached on a field, we said to the owner, who was weeding, "You must lop off some of the branches of this tree, or your khēt will be destroyed." "By no means," he replied, "'Tis a God, and walks where it lists."

In the villages of this neighbourhood, you meet with a great variety of Rajpoot tribes,—Bhattis, Seesodias, Solankes, &c.; a fact accounted for, by the matrimonial custom of a foreign bride being attended by a few of her brethren, who follow her fortunes, and settle in the country of her husband. It is, to me, quite inexplicable, how in the confusion of names, the Rajpoot crime of incest can be avoided; since (not to mention the Sachas) many of the minor branches even

the Otes and Awuts of the great families, are constantly confounded with their roots, and you will hardly ever get a list of the so-called 36, from a Bhat of this quarter, without his including in it the Chondawuts and Suktawuts, and increasing the number of names to 50, 60, or more. The most respectable of these classes themselves, petty rajas, potails, &c. are in the highest degree ignorant of their heraldry,—presenting in this respect a striking contrast to the purer Rajpoots of Mewar; a large proportion of whom have the *gotra acharya* at their finger ends; while many will repeat the names of their ancestors for ages back.\*

From Ashta to *Sehore* we found nothing deserving mention; but the antiquity ascribed by Tod to Bhopal, stimulated our zeal to search for Budh relics: and we began to indulge in visions of success, on finding a statue of that sect by the road side, half way between *Sehore* and Bhopal—and on being told, that the hills round the city abounded in caves, in some of which we should find inscriptions: yet, after all, our hopes were not realized. The inscriptions in the caves, which were all in modern Nagari, proved to be chiefly dates, names, and prenames, excepting a few of greater length; only one of which however was at all decypherable.† The caves, mere cavities without carving, have a few of them been walled in and inhabited. In one near the old fort, a fakir lately made himself a very cosy dwelling place; but the superstitious women of the town so pestered him, that he fairly ran away from them.

The first impression of a stranger on visiting the city, will be by no means a favourable one. It is entered,—either by a hard, uneven, rocky way (road it cannot be called) with considerable risk to one's horse's knees,—or through heavy sand and mud; for the sandstone when once broken, soon crumbles to dust, and no one will take the trouble of making a firm road, from the trap and kankur which might be easily brought from the neighbourhood. Being built on a hill, there is hardly a public level space in the whole town, with the exception of a spot used as a manège, little bigger than a London riding school; and the narrow streets are choked with dirt.

\* Some of the Jain heads of colleges have astonishing memories on these matters, and assisted by a Memoria Technica will repeat such long lists of names—of their *acharyas* for instance, or the minute divisions of the *ginats*—and such whole volumes of verse and prose, as to reconcile our faith to the almost incredible accounts of the oral preservation of their learning, by the Budhs, the Druids, and the Greeks.

† Insc. No 2. It is hardly worth sending, but to shew the modern character.

The city however, especially if viewed from a height, has a remarkably lively and pleasing appearance: white terraced palaces, and the light domes and minarets of mosques and tombs, peer above the houses in every direction. The rock-bound lake washes the town, and little outworks from the fort, (which has perhaps more of beauty than of strength)\* stretch to the water's brink, and add much to the picturesque of the scene. Nor must we forget to notice the gardens filled with fine trees, and the really splendid baolees, containing numerous shady apartments for the convenience of the traveller. Some of the mosques, &c. may in after times yield matter for the antiquary: for, the Mussulman,—“non in aliâ re damnosior quam in ædificando”—not content with mutilating the detested images, is every day using them as material for his buildings, turning the sculptured part within.† A few days before our arrival, a stone tablet from some old temple, in the neighbourhood, containing, it is said, a long inscription, was buried under the foundation of a splendid musjed which the Begum is erecting:‡ another slab was about to suffer a similar fate,—the authors of the sacrilegè being in this last instance Jains, but a copy of the inscription was taken before its consignment to earth. Captain Burt has I believe sent it you.§ As Bhopal is encircled with ruined towns, thefts of this nature are committed very generally by all classes, stones being frequently brought from so great a distance as Bhojpoor.

We could not visit all these ruins; so we preferred passing by Shums-gur, from which the two *bijeks* above alluded to were brought, and which as the nearest to the city, has been the common quarry for ages. We set out in high hopes, for a village, (of which the name has escaped me,) about eleven miles off; which was fabled to possess a marble stone,—Heaven knows, how many yards square,—covered all over with writing. On arriving at the place, the stone was not to be found; and though we teased every soul in the village with questions,

\* Both the fort and citadel are contemptible as fortifications, spite of the famous siege.

† A common practice, J.A.S. 3; 618. Mrs. Meer Hussun, 2; 138, &c.

‡ A buniah who had seen it, consoled us by the assurance that it was about 6 or 700 years old, and related to some Raja or town named Bid (?). That he could read it at all—proves that it was modern.

§ A fragment (No. 3.) that you may verify it is forwarded. We delayed taking a facsimile till our return from Saugor, in the interim a piece which had been chipped off one corner, was lost. We can make no sense of it, though the letters seem plain enough.

no one had ever heard of such a thing. Bhojpoor, four miles further on, was, according to Tod, an ancient Policity; the present name must therefore be modern, and is probably derived,—not from the more ancient Bhoj, of whom the old song tells

“Rajah Bhojho bari  
Vedya Jan to sari”—

but from his scarcely less celebrated namesake—the historical puzzle—the father of Udayaditya.\* In support of this supposition, we have the following traditionary fragment—here in every one’s mouth—which at least proves, that the only building of consequence at Bhojpoor, was erected at about the period of this later Bhoj, and not improbably to his honor, by his son Udayaditya. It sounds like broken verse, but we could never get the couplet completed.

Muchalpoor ka baolee our Bhojpoor ka kumbh,  
Udayapoor ka dehura (were built by one man,)

Now for the architect of the temple of Udayapur, we have, as will be presently seen, the certain date of A. D. 1049, and there is in the buildings themselves (in the two at least which I have seen) a certain conformity in boldness and grandeur of design, justifying the tradition, which attributes them to one master mind.

The temple of Bhojpoor would be admired in any country. In the centre of a lofty chamber, about thirty-five or forty feet square,† whose light and elegant dome is supported on the four far famed kumbhas, and on a handsome pedestal, stands Deus Loci, a Ling.

It is the peculiar excellence of this building that though the whole is of massive form and material, the parts have been so nicely proportioned and blended together, that it presents an admirable appearance of combined solidity and airiness. Thus for instance, the platform of the Ling is  $21\frac{1}{2}$  feet square, and about *ten* feet high—a bulk, which if solid, would be out of all proportion to the size of the temple; but the architect has escaped this reproach, by simply giving it a light and elegant shape. The sketch, though from memory, will serve to explain the plan of it: the lower table is formed of four stones, so neatly fitted together without cement, that it is a point of faith in the neighbour-

\* We postpone our remarks on this riddle, till we shall reach Udayapur, where there is a long inscription bearing upon the question—but not deciding it. Since writing this, the inscription has been noticed, J. A. S. 7: 1056 I cannot at this place refer to the original to redeem my pledge.

† Some of my pencil notes of this place are effaced, the doubtful measurements are therefore put in *italic*, the others in figures.

hood to believe them one huge slab. The two upper stories, (if they may be so called,) are similarly composed, and are but little, if at all, less in size; but I need hardly point out, how much the rounding of the edges, and the consequent cushion-like appearance, and even the ornaments at the corners of the upper table, relieve the heaviness, which would seem inseparable from such large blocks of stone. The idol is reached by steps, which being on one side, and half concealed by one of the pillars as you enter, do not detract from the effect of the *coup d'œil*; and this noble and seemingly insulated throne of rock, crowned by a Ling  $7\frac{1}{2}$  feet high and 17 feet 8 inches in circumference, so well accords with the dark pillars which bound it, that it can hardly fail to impose on the approaching worshipper a mixed feeling of awe and admiration. The art of the architect is again displayed in the pillars. It was desirable to adapt them, in some measure, to the necessarily confined boundary of walls, without detracting from their solid grandeur. This has been effected in an ingenious manner. The shaft, (which, if I remember rightly,) rises from a base six feet square, is divided into three nearly equal sections. Of these the lower is an octagon, each of whose sides measures  $2\frac{1}{4}$  feet; the sides of the second, also an octagon, are somewhat narrower, or about  $2\frac{1}{2}$  feet; the third has 24 sides, of a little less than 2 feet; so that the pillars have the appearance of tapering, while in reality they are nearly of the same thickness throughout. Even after this, the pillars would have but a gloomy look, were it not for the door-way, which, unlike the usual entrance to a temple, occupies nearly the whole of one of the sides of the square. This entrance, it is true, seems to have been enlarged by violence, but it was evidently from the first, lofty and spacious.

The simplicity,—which has been religiously preserved in the walls of hewn stone, in the unornamented pillars, and the plain pedestal of the Ling,—was exchanged in the upper part of the temple for rich and elaborate carving. The dome seems to have been one mass of ornament. I say seems, for alas the barbarian has not spared this beautiful structure, and all that remains of the roof are the sculptured edges. Under the shelter of this fragment, a mere narrow rim, and clustering on the projecting cornices, numerous families of bees have taken up their abode, whose never-silent humming, re-echoed from the hollows, struck me as in melancholy unison with the solemn ruin. We counted no less than fifty-two of their black nests. Never robbed of their honey, and accustomed to the crowds, who at certain seasons assemble to pay their devotions to Bhojswar, these insects are not the least alarmed or irritated by the noise of strangers, nor even by smoke, to which bees

are in general so averse ; and though at first, it is not a little alarming to find them falling every instant on your face and person, as they get disabled in their constant battles above ; yet they never sting, and you soon become accustomed to their buzzing around, and crawling about you. If once provoked however, their vengeance is dreadful ; and the chief of a Math of Gosains attached to the temple, assured me that on some few occasions when this has happened, it was not safe to approach the place for days. He likewise hinted that if a persecutor of their master approached the Ling, Mahadeo's Fouj would instantly detect him, and probably sting him to death. A Moonshi with us had laughed at the story ; but just at this moment the wind grew high, and the scattered insects were blown about our faces in hundreds : our Mussulman friend evidently thought they had found him out, and much to our amusement, and most especially that of the Mahunt, we observed him quietly stealing off, and saluted him with a peal of laughter.

The Gosains of the Math, above alluded to, reside in a small court in front of the temple. As usual in these monasteries they were very civil and communicative, and though now poor,\* (the few lands on which they have rights affording little else but pasturage,) boasted largely of their former fortunes, and assured us that the establishment was of a very ancient date ; an assertion in some measure borne out by several venerable looking Samadhs, the graves of former Mahunts. They pretend indeed that the Apsara was founded by Bhoj, or that at least it was coeval with the temple ; which claims may not be credited, but cannot be disproved,—all the papers and grants of the Society having been lost (in a fire, I think) many years ago ; which leaves the question in a convenient uncertainty.†

Bhojpoor is at present a small poor village of mud huts, and if we may judge from the scantiness of its ruins, was never a town of any size or consequence. The only building worth visiting besides Bhojeswar, is a Jain temple. remarkable for an image twenty feet high. Statues, of such large dimensions are approached, to be worshipped, by stone steps, which are built close to the wall on either side of the

\* I think the Mahunt calculated the yearly value of the lands at 750 rupees ; the actual members of the establishment are about 30,—the residents not more than 10 or 12.

† Hyat Mahomed of Bhopal renewed their Sunnuds (we could not however get a sight of the Tambaputras,) and from his time only their history can be depended upon. They read to us the list of Mahunts, all whose names have the distinctive termination of Bun.

saints. In talking of these steps I carelessly made use of the word "siri," (instead of paoria or pugtia,) much to the horror of my companion, a Jutti. The incorrectness of the term as applied to *stone* steps, he said was a trifle, but the word itself was unlucky, and of bad omen, which to pronounce in a temple, was almost sacrilege, and to pronounce any where was a breach of good manners, as it is the name of the bier on which a corpse is carried. Close to the Jain temple, (Mr. Wilkinson informs me) there is a cavity in the earth, from which a warm air issues; unfortunately our guide, either stupid or sulky, failed to tell us of the phenomenon, and we lost the opportunity of examining its nature.

Continuing our journey in a southerly direction, some singular looking masses of black rock, cresting a high hill to the right of the road, attracted our attention. They are known by the name, (common in all parts of India to such seemingly art-shaped stones,) of the Pandu, Bhim; and though worshipped by the country folks, (who celebrate fairs there some once or twice a year,) are, we were assured by our guide, mere natural rocks, unfashioned into their present pillar-like form by human hands, and not sanctified by any ancient images or sculpture. A personal verification of the point would have been more satisfactory, but we were obliged to take our informant at his word; as though from their conspicuous position on the brow of the hill they appeared quite close, they were at least nine miles off, and our time only admitted of going as far as Asapuri, two miles from Bhojpoor.

This village should be visited for some very beautiful Vishnooli images; which though their temples have been thrown down by some zealous servants of Mahommud or perhaps of Sheo, are themselves generally unharmed, being concealed and protected by the huge stone beams of their roofs, which seem purposely to have been allowed to fall over them, and under which you must creep to view them. The scattered ruins are richly sculptured, but we will merely specify some of the principal images.

1st. Bhoot Nath Gee, so our guide named it, probably incorrectly; as Bhoot Nath is a form of Mahadeo, and here every thing seems Vishnooli. My pundit called the figure Hunuman, but the tail was wanting.

2nd. A highly ornamented image, the size of life of probably Indrajit, with a pair of ankleted feet in front; near it a Varaha.\*

\* The worship of Indrajit, or Megh Nath, seems (as will be seen in the sequel) to be popular in these parts. One of the most beautiful temples in Malwa, and the chief view at Wane, is a shrine of Indrajit.



3rd. A Shesh Sohail, sculptured with admirable skill and taste. On a table supported,—at the back, by the stalks of the lotus,—in front on the heads of worshippers,—lies folded the Nag, whose hood shades, as its body furnishes a bed for, the sleeping Bhugwan. The god is represented as Chatoor Bhooja, and is surrounded by attendants, choristers, &c. In front kneels, expecting his waking, Luchmi; before the image are the Churrin, two pair of which are also sculptured on a loose square stone near it.

4th. A curious image of the “Fulfiller of Hope,” from whom the village takes its name; her immense breasts distinguish her as the Indian Juno Lucina.

The drawing represents a small conical cup or basket which appears to issue from her thigh: out of it peeps forth a child’s face, round which the edges of the cup closely fitting, have much the appearance of a baby’s cap.

On the other side of the village lie the ruins of what must have been a very large Jain temple: jungle, and thorns had grown over them; crawling among which, not without difficulty and pain, we discovered,—a statue of Santinath, standing sixteen feet high, a large sitting figure without *sanchun*,—and many smaller images.

At a village near this, we were received with the country welcome of the *kullus*; a few women brought two lotas of water, one put over the other, with a pân leaf at the top, and placing them at our feet, began singing a song, which they expect one to reward by dropping a trifle into the kullus. The officiators at this little ceremony are usually those of the lower Jats, such as live in the outskirts of towns, near which they take a position when a great man is passing on any particular occasion, standing silent with their lotas on their heads. They thus waited outside Maheswar, when Hurry Holkar escaped from his prison. Occupied with more important matters, or perhaps having no superfluous cash, he passed them all, it is said, without notice, merely dropping one rupee into the last kullus. This so unusual a proceeding was considered most impolitic; the old crones in the neighbourhood shook their heads, and prophesied all manner of evil; and a failure would have been doubtless looked upon as omened by, or consequent on, this ill-timed parsimony. To pay this compliment (*kullus budhana*) is a not uncommon practice; Tod and others allude to it.\*

\* Near Purra and Saush in Afghanistan the old ladies have a less agreeable custom, though somewhat similar to this—they throw water over the traveller and his horse as he approaches, to guard him from the evil eye.

From Bhopal to Sanchi, the villages, (inhabited by Gonds, miserable in appearance, and sunk in the grossest ignorance) will afford but few ruins, on which the antiquary can exercise his fancy or judgment. Even the temples elsewhere so common, are seldom found here; or if found, have but little *pooja* made in them, in lieu of the more generally worshipped Deotas of the country—the Bairawas, Lings, and Matas. The villagers pay their adoration to a parcel of small stones arranged in a square or circle, forming walled enclosures of a few yards, with a small gap for an entrance, the stones opposite which, from their larger share of paint, seem the principal objects of *pooja*. These gods, with a curious contradiction, (for the stones are rarely so high as a foot,) they call the Burra Deos; and though they pay a general reverence to the Hindoo Pantheon—for as one of them told me, once a year a goat dies (*bukri murta*) to Kali—these are the powers to whom they look, in the hour of joy or sorrow, round whom they wind the votive thread,\* before whom they throw the marriage *mour*†, and hang up the old plough at the *singust*.‡ In one of these inclosures we remarked several clubs set up, and on asking the cause, were told that finding all prayers and ceremonies ineffectual to stop a sickness which afflicted the neighbourhood at the commencement of this year, they had determined to threaten the great gods with a beating; and sickness having shortly afterwards ceased, they believe their remedy to have been efficacious.§ At one village, Sahapoor, two miles south-east from the halting place between Bhopal and Bhilsa we wereshewn about forty or fifty (unfortunately we forgot to count) figures of horsemen carved in sandstone, about a foot and a half high, and ranged round a small walled inclosure in an oval; of the warriors who

\* Made of threads, and commonly seen encircling Lings. The grateful piety of mothers whose infants have survived the small-pox, generally prompts this simple form of devotion.



† The caps made of split date leaf, or false jewellery, of a Hindu bride and bridegroom. When a river is at hand, they are generally thrown into it, otherwise at the feet of some deity. The custom, doubtless of great antiquity, may be traced in other countries—and as one of the many coincidences between Yavan and Hindu manners, which seem to argue a common origin, we may notice the resemblance of the *Sehura* of an Indian maiden, to the tinsel cap of the Athenian bride.

‡ The old plough alone is thus gratefully honored (the iron however taken off) every twelfth year, other worn out articles, brooms, baskets, ghurras, &c are merely thrown out in a heap.

§ A method of managing the gods of which there is a well known example in History, and one still practised by some of the hill tribes of India.

rode the horses (many of which are richly housed in the native fashion) the legs and spears, and a few heads which lie at the feet of the chargers, alone remain. Not one *body* was to be found, which renders it probable that these fragments have been brought from some other place. We eagerly inquired of the villagers where they came from, their names, their history, and whether there were any more such statues in the neighbourhood: no one was able to give us the slightest information. At last to our reiterated questions, and promises of reward to whoever would shew us any temples—any Deos—a lad replied that he would be our guide to a big god. We toiled after him over several fields, doubting, guessing, and hoping, till he stopped and pointed with a grin (I really believe the half-idiot-looking rogue knew that he was taking us in) to what in our zeal we had quite forgot—the circle of little stones, the Burra Deos. Though we were thus unsuccessful, I am by no means satisfied that a more extended investigation than our time permitted, would not have brought to light some temples or monuments with which these figures were associated, and which might afford some clue to their object and history.\* We only saw one other statue of a horse in this neighbourhood, that of which mention has already been made in the Society's Journal.† It stands unconnected with any other sculpture on the hill from which it has been cut, at a village a mile south-south-west from Sanchi. Supposing these horses to have been originally placed in their present position, several explanations of their history offer themselves, but none that seem to me sufficient; thus, for instance, in Mussulman *astanas*, hundreds of small horses with riders are heaped together in honor of Alexander; but the horses thus offered, are rudely made of burnt clay, while those be-

\* Accompanying is a drawing of one of the images, which we brought away, as the villagers pay them no respect. The walled inclosure rather resembled the ruins of a hut than a place built expressly to receive them.

† Journal Asiatic Society 3; 489, where the *m* of the plan should point S.S.W. instead of S.E. It was buried in earth, all but the head and upper part of the back, and had been so, said the oldest inhabitants of the village, as long as they could remember. Two men cleared out its grave in about 12 hours, and brought to light a rudely fashioned, unornamented figure 12½ feet from head to tail, about 10 feet high, with a head 2½ feet long. The neck and belly are clumsily supported on two columns (if I may so call them) of this shape  which are cut out of, and still adhere to, the same block of stone from which the horse is carved. On the recess were scratched, rather than engraved, two marks  The other image at the same place, alluded to in the Journal, is modern and Braminical.

fore us are carefully carved and ornamented ; and such *astanas* seem peculiar to the south of India.\*

The dread of villagers, Shaka Siam,† is represented on horseback with a long spear, as is the Deccan favorite Kundee Rao, and Pabooji, whose picture may be seen in Tod, and Ramdeo, a Marwari incarnation of Krishn, and many others : or we should at once have set them down as the twenty-four Bagrawuts,‡ had not the worship of those worthies been peculiar to Mewar and the countries near it. It would be a mere waste of time and paper to notice the various forms and seasons in which the horse is worshipped in India ; we will not therefore weary you with a vain parade of research, but content ourselves with

\* As are a large proportion of the customs described in the Quanoon-i-Islam, quod vide page 279.

† A corruption probably of Saka Swami, the Lord of Slaughter, for he is principally worshipped, I am told, on fields where a battle has been fought. His statues are more commonly found in company with those of brother spirits, as Goga, Phurna Gee, &c. but he is said to have a temple to himself, at Nursinghur near Bersiah. The following story related to us by an old villager, will remind you of the black rider of the Hartz. A buniah had to return home from a Mela, but the gains of the day were in his purse—night was coming on—the road was of bad repute, and he feared to go alone. A soldier passing by, offered himself as an escort—No, objected the buniah, you are armed, and I am weak ; you yourself may rob me. Anxious however to get home, and encouraged by reiterated assurances of protection, he agreed to trust himself in the stranger's company, provided he would swear by Shaka Siam to do him no injury. Shaka Siam is between us (*beeckmen*) replied the soldier ; but no sooner was the village out of sight, than he robbed the unhappy merchant of not only his money but his clothes, tauntingly exclaiming, Where is your Shaka Siam ? if he be between us why does he not assist you ? Hardly had the words passed his lips, when a tall horseman was seen in the distance—his jet black steed outstripped the wind—one moment, and the soldier was transfixed by the lance of the rider. The poor buniah had closed his eyes in terror—when he looked up, the horseman had vanished—the soldier lay dead at his feet.

‡ That very singular class of people, the Bhopas, who are the Pundas (poorjais) of most of the heroes I have enumerated, carry round the villages a long cloth called a *phow* फव (similar to the *pats* for which Juggernath is celebrated) on which the history of the twenty-four brothers is painted in glaring colours. I have one six feet long, and a yard high, which, if a novelty, I propose offering to the Society's acceptance ; annexing to it the explanatory legends, which though Tod seems to have thought them unworthy of record, are indispensable to one who wishes to understand the theology of these regions. Pabooji has a *phur* to himself, which shall also be sent if acceptable : of Ram Deo and his worship a description is deferred to another occasion. Tod's Rajastr. I, 730. 2, 759. [ I sent this down to the Society a year ago, but have not heard of its arrival. The rest of my engagements I must beg to renounce ; the fulfilling of them is here impossible.]

citing one instance of the superstition which seems to have some connection with the point we are discussing. In the old Happa Raj, a number of brass images, with horses heads, are ranged on the top of a mountain, and held in great veneration: they seem, says Tod,\* to mark the site of some victory. Till a better explanation be suggested, we may suppose our images to be something of this nature, and ascribe them (*a la mode de* Tod and Wilford) to the Hihyas, who anciently dwelt in this neighbourhood; though perhaps the horse-worship was rather the characteristic of the children of the sun.

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### ART. III.—*On an Aerolite presented to the Society.*

A short time before the Cabul expedition, I procured through the kindness of the Resident at Indore an Aerolite, which had then lately fallen near Ougein, and of which I have the honor to request the Society's acceptance. Being at the time the stone fell, laid up with fever, I was not able, as I could have wished, to visit the spot on which it lighted, but intelligent persons were sent to report, who gave the following information.

On Sunday the 2nd of Asar (sudi) two stones fell from the sky at the village of Doondhoo Dabun, belonging to Manik Chuud, Kaith, seven coss from Ougein on the Burnuggur road.

It was about nine o'clock in the morning, when a few claps of thunder were heard, but there was no rain: (or to translate my informant's letter literally, a dry cloud thundered once or twice.) Immediately afterwards a sound reached our ears, and we learnt that two stones had fallen, one 200 paces from a Gosaeen's baolee, near the east quarter of the village, the other a stone's throw from the baolee, in a field belonging to Khusal Patail. The last stone dropped one hour and a quarter after the other. Three men were ploughing close to where it fell, who running up to the spot, found that the stone had gone two *hâts* deep in the earth, which had dried up for more than a foot on all sides of the cavity, though the whole ground and beyond that was wet.

\* Tod's Raj. 2, 303. A horse seems to have been an almost universal type of victory, of which the white horse vale in Berkshire is one well known instance. A number of brass images of horses are scattered about Aboe, A. R. 16, 298. The Bheels, says Sir J. Malcolm, make small mud images of horses; see T. R. A. S. 1, 72.

Of these two stones, the smaller (which however when brought to me was nearly the size of a man's head) is the one sent to the Society. A few pieces have been chipped off for specimens. There is nothing peculiar in its appearance. The inside is of the usual grey colour, with here and there small pyrites intermixed. The outside was of a pale brown, and smooth all round. The villagers smeared it over with ochre of which the stain has remained. The other stone has, I understand, had a temple raised over it, at the spot where it dropped. On the same day, a stone fell at Sursanoo (a coss and a half off from Ghorabund) in the Pergunna of Burnuggur, to which last place it has been taken and enshrined as a Ling.

I could not learn that any meteoric light attended the fall of these Aerolites.\*

ART. IV.—*Extracts from the Mohit (the Ocean), a Turkish work on Navigation in the Indian Seas. Translated and communicated by JOSEPH VON HAMMER, BARON PURGESTALL, Aulic Counsellor, and Professor of Oriental Languages at Vienna, &c. &c.*

(Continued from vol. — p —.)

## SECOND CHAPTER.

أُس Of the fundament (Oss) which is generally used of the Solar and Lunar years —the Roman, the Coptian, and Persian year—in seven Sections.

### SECTION I. *Of the Lunar and Solar years.*

The solar year is of 354 a fifth and a sixth part of a day, and has twelve months (alternatively), one perfect, and the other deficient; if the last month is also a perfect one of thirty days, the year is an intercalary one, the regular alternation in the middle way.

### SECTION II. *Of the fundament of the Lunar years.*

باقی کہ التمش فالو (1) The way of obtaining it is to subtract from the years of the *Hedjrat* the imperfect year; for example, of the year 961, you subtract one, and multiply the rest, which is sixty, with four; (1) calling the result *Mahssool* (product);

رانی دوروه ضرب  
ایده سین

\* See Journal Asiatic Society, 7. 668

(2) **خارج قسمت** lay this beside, multiply again sixty with eleven, divide what you obtain with thirty, and add the issue (2) of the division to the *Mahssool*; if that what remains of the thirty, is less than nineteen it is not counted, if it is more it is counted for thirty. The *Mahssool* and what issues by the division in seven parts, what remains is called the fundament (3).

(3) **أس** If there be no fraction, it is called *fundament of the seven*. The beginning is from Tuesday, and the day with which the calculation ends is the first *Moharrem* of the year. If you wish to know the first day of any other month, you must count each two months of the lunar ones for three, viz. the first for two, and the second for one; subtract them of the lunar fundament; if it exceeds seven, that number and the rest gives the fundament; if it is no fraction it is again *the fundament of seven*; the day to begin with is Tuesday, on the last day is the first of the month inquired for. For example, if you wish to know the first of *Moharrem* of the year 961, throw away the hundreds,

(1) **كسور دن** (900) **ماتدن** and from the rest one; multiply the rest (4) with four, which makes 240; this is called the *Mahssool*; multiply again sixty with eleven, which gives 660; divide it with 30, the quotient is 22, which added to the *Mahssool* gives 262; if you divide this with seven, there remains three for the fundament, beginning with Tuesday, the last day is Thursday, which proves to be the first of *Moharrem*.

Now if you wish to know the first day of any other month, for example the first of *Ramasan*, begin to count from *Moharrem*, which gives eight months, counting *Moharrem* for two, *Isafer* for one, and so on (the first month counting for two, the second for one) so the above eight gives twelve; add to it the fundament of this year (3) you obtain 15; subtracting from it the seven (contained therein twice) remains one. Beginning again to count from Tuesday, you arrive at the end again to Tuesday, which is the first of *Ramasan*, and so on.

### SECTION III. *Of the fundament of the Solar year.*

The solar year is called also the year of the *Boroody* (the 12 constellations of the zodiacus) the Roman and Coptic year. The way of finding it is the following. You throw away the hundred and the exceeding year. **مائي و كسوري** The rest, whatever it may be,

multiply with eleven, the result of the multiplication is called *Mahssool* (product); the rest multiply with seven, throw away 30, divide what remains with 60, subtract the quotient from the *Mahssool*, the remainder is the fundament of fundaments.

أس ألا سوس This is the fundament of the Solar, Roman, and Coptic year. Another way to find out this fundament is the following. You must multiply (after having thrown away from the year of the Hedjrat the hundred مائة and the odd number) the remainder with 10. This is also called *Mahssool*. The remaining 50 you multiply with 3, the result of this question you add to 30, divide the whole, whatever it may be, with 60, add the quotient to the *Mahssool*, and you have then the *fundament of fundaments*; if this number exceeds the number of the solar year, this must be subtracted, and the remainder is the fundament of fundaments. For example, if of the year 961 you wish to find the fundament of the Solar, Roman, and Coptic year, you throw away the hundred and odd number so that 60 remains; multiply with 11, the product is 660, multiplying this with 7, you obtain 420, throw away 30, and divide the remaining 390 with 60, the quotient  $6\frac{1}{2}$  is reckoned as seven; because the half and what is beyond is reckoned as one, and what is below the half is not reckoned at all; subtract this seven from the *Mahssool*, the remainder is 653. Subtracting from this sum the solar year you obtain 288, which is the fundament of fundaments. The second method is as follows;—of the year 961 you throw away the hundred and unity, multiply the remaining 60 with 70, this gives the *Mahssool* 600; multiply this with 53 you obtain 3180, add to it 30 it makes 3210, which sum divided by 60 gives the quotient 53, adding this to the *Mahssool* you get 653, of which subtracting the solar year you have 288, the fundament of fundaments.

#### SECTION IV. *Of the method to know the Solar, that is to say Zodiacal, year.*

The beginning of it is the entry of the sun into *Aries*, which is called *Nawrooz* *Sultauni*, that is the *Sultanic new year*. Be it known to you that the first day of Nawrooz is the same day (of the week) which follows the next Nawrooz; for example, if the Nawrooz falls on Saturday, it will fall the next time on Sunday, and in intercalary years one day more, on Monday. Be it also known to you that the *Nawrooz Sultauni* and the intercalary year are not the



same on all points of the globe ; in some years the year will be an intercalary one for places of great longitude, but not for places of lesser longitude, in which the intercalary year is only to come on in the following year ; this is evident to all persons of sound understanding. But to go on with the subject, if you add to the fundament of fundaments the sum of 172 you obtain the fundament of the constellations of the zodiacus ; if this sum be greater then the number of the solar year you subtract it, and the remainder is the fundament. For this operation there is no regard for the intercalary year ; you subtract the fundament of the constellations from the broken lunar year, and if this cannot be, you subtract it from the solar year, add what remains to the broken lunar year, subtract from the whole the solar year, and obtain by this operation in the remainder the number of the days of the zodiacal year ; you assign to each of the twelve constellations its number of days, and the sun shall be in the degree of the constellation in which your calculation ends, the number of the degrees are

|               |                 |                     |                     |                  |               |
|---------------|-----------------|---------------------|---------------------|------------------|---------------|
| <i>Aries,</i> | <i>Taurus,</i>  | <i>Gemini,</i>      | <i>Cancer,</i>      | <i>Leo,</i>      | <i>Virgo,</i> |
| 31            | 31              | 31                  | 32                  | 31               | 31            |
| <i>Libra,</i> | <i>Scorpio,</i> | <i>Sagittarius,</i> | <i>Capricornus.</i> | <i>Aquarius.</i> | <i>Pices,</i> |
| 30            | 30              | 29                  | 29                  | 30               | 30.           |

For example. if you wish to know in which degree the sun is to be found in the year 961, you proceed in the following way. We know by what has been said that the fundament of fundaments in this year is 288 ; add to it 172 it makes 460, subtract from it the number of the solar year, 365 days, there remain 95, which you subtract from the broken lunar year if you can ; as it is impossible in this year to throw away the first of Ramazan, you make the subtraction so that one month is perfect and the other deficient, and counting also the first of Ramazan you obtain 237 ; from this you subtract the above-mentioned 95, there will remain 142 ; of this sum you assign 31 degrees to *Aries*, 31 to *Taurus*, 31 to *Gemini*, 32 to *Cancer*, and the remaining 17 to *Leo*, so that the sun is to be found in the seventeenth degree of *Leo* ; the constellation of *Cancer* has in our days 32 degrees, although *ابو نصر فراهي* Abou Nassr Ferahi mentions in the *نصاب* *Nessab* the following distinction :

XXXI and XXXI, XXXI. XXXII, XXXI, XXXI, are six months  
XXX, XXX, XXIX and XXIX, XXX, XXX, are the short months

لا ولا لا لب را ولا لا شش ماه ست لل كط و كط لل شهر كونه است  
But this agrees with the time when the sun in its greatest height is in *Gemini*, now the sun being in its greatest height in *Cancer*, this has

32 degrees, which will change in future time so that the constellation wherein the sun is in its greatest height is always to be of 32 degrees ; be it known also that in the first climate summer falls in the signs of *Aries*, *Taurus*, *Gemini* ; autumn in those of *Cancer*, *Leo*, *Virgo* ; winter in those of *Libra*, *Scorpio*, *Sagittarius* ; spring in *Capricornus*, *Aquarius*, and *Pisces* ; in these parts, that is in the northern ones, it is the contrary. If you wish to know in which of the 28 lunar stations the sun rises, you proceed as follows ;—add to the number of degrees in which the sun is found that day, the number 8 ; give to each station 13, except *Spica* to which you give 14, and if the year be an intercalary one you give also 14 to *Resha* ( $\beta$  in the Andromeda) ; the beginning of numbering is in our times *el Anwa* ( $\beta, \gamma, \delta, \epsilon$  in *Virgo*) because the beginning of *Anwa* falls in the 22nd degree of *Spica*, and the end of it in the beginning of *Libra*, that is to say the beginning of it retards eight degrees.

But the stations of the moon proceed with the eighth sky in 70 years one degree, according to which you must operate. Where the number beginning from *el Anwa*  $\beta, \gamma, \delta, \epsilon$  in *Virgo* terminates at sunset, غروب شمس there the station of the moon is rising ; for example—if you wish to know which station of the moon is rising at sunset on the first of Ramazan in the year 961, you find the sun in the seventeenth degree on the 142nd day of the year of constellations. Add to it the number 8, you get 150 ; begin then from *el-Anwa*, the 13th station, counting for each station 13, but to *Spica* 14 ; six days to the 24th station  $\beta$  and  $\xi$  in *Aquarius* ; six days having elapsed since the rise of this station, called *Saadessofood*, so that there remain nearly seven days. Be it known also that the beginning of *el-Anwa* at the end of the 23rd degree of *Spica*, and its retard of eight degrees from the beginning of *Libra*, happened in the year of the Alexandrine era 1749, that is to say in the time when the tables of Ulughbeg were made. This book has been composed in the 1865th year of the era of Alexander (the Sileucian) 1553 s. E. so that 116 years have elapsed between. In this case each station has moved nearly two degrees in our time, and it is therefore necessary to add to the number of the solar degrees the number *six* ; seventy years hence when the stations shall have proceeded one degree more, the number *five* must be added and so on till the beginning of the 13th station (*el-Anwa*) shall come to the beginning of *Libra*, in which time no number shall be added ; when afterwards the end of *Isarfa* (the 12th station) shall come to the beginning of *Libra* the number 12 must be added, and you

will begin then to count from the beginning of *Isarfa*, and in the same way you proceed through the other stations.

•  
SECTION V. *Of the (Romi) Roman year.*

It begins with the first day of *Teshreen end*; be it known that the day of the week with which it begins precedes the day of the week with which the following year is beginning; for example, if the first day of the year be Sunday, the first day of the next year will be Monday. The fourth part of a day, (which is exceeding every year) gives in four years the intercalar day. In this year the day of the week of the next year is two days later, on Tuesday. It is also to be observed that even in the Roman year the seasons must change in the course of time, which the greatest part of men are unaware of: so in the course of time the months of spring must become those of Autumn: because according to the tables of *Ooloozbey*, there are wanting to the fourth part of the day forming the intercalar, one 28 to the second, and 40 to the third. But as in the Roman years a fourth part is counted, the above said deficiency makes in  $123\frac{1}{2}$  years one day to be added, the cause of it is that the fourth part of a day counted each year is not exactly a fourth, but deficient; which implies the necessity of adding one day more to the above mentioned space of years. For example, the *Nawrooz* *Sultauni* falling now on the 11th Adas, that is to say March, shall fall after the above mentioned time on the 10th, then on the 9th, and make the four for some calendarian works. The day of *Nawrooz* *Sultauni* is found mentioned on the 13th of Adas. This book has been translated in the year 1865 of the Sileucian era; the difference since the establishment of that era makes 14 days at the time of its introduction, the beginning of spring; that is, the entrance of the sun in Aries was on the 26th of March; but as a long time has elapsed since people are in general not aware of this era, *Nasicreddin Toosi* (the great astronomer) calls in his treaty celebrated by its name *Si* (Thirty) the Roman year the *veritable* one, but it is not so, حقيقي the *veritable* one is the year of constellations commonly called the *Djelatian* year. It is a curious fact that the great astronomers *Mirza Ooloozbey*, *Mir Ghaiaseddin*, *Djemsheed*, *Hazizade Koomi* and *Molla Ali Kooshdji* (on whom be God's mercy!) call in the new Ephemerides the Greek year the solar one, which is a negligence. On the 7th February the first kindling spark چمره of spring is falling; on the 4th the second spark; on the 21st the third, after which the cold of winter is broken; on the 26th is the cold day of

the old woman ; on the 18th Agar\* the beginning of warm winds ; on the 19th July the first canicular day, after which the heat is broken. This is the way in which our astronomers fix their days, but with no reason, because they ought to fix them according to the seasons, and not according to the Roman year, which is not stable.

The way of knowing the Roman year is to add to the fundament of fundaments 10, the sum gives the fundament of the Roman year, subtract it from the broken lunar year, the remainder gives the days of the Roman year, the names of the (*Roomic*) year are with the number of days as follows,

Teshreen I. 31. Teshreen, I. 30. Kanoon I. 31. Kanoon II. 30 and Shooaba I. 28. Arer 31. Nisan 30. Ayar 31. Haziran 30. Temooz 31. Ab 31. Eilool 30.

If you wish to know on which day of the Greek year falls the first of Ramazan, add to the fundament of fundaments 288 the number 16, it gives 298, subtract it from the broken lunar year, which not being possible as the number is 237, you must add the number of the solar year, which makes 602, from which you subtract the fundament of the Roman (Greek) year ; the remainder is 304, which you distribute according to the months, and you will find the day to be the last of August. For the Roman (Greek) year the birthday of Jesus, the days of *Khizr* (St. George's) and *Kasim* (St. Demetrius') fall for ever on the same day, but not so the Lent and Easter ; the Lent falls in the simple years between the 2nd of February and 8th of March, and begins from the Monday nearest ; the number of its days is 48, the 49th Sunday being Easter Sunday ; if Lent begins on the 8th of March, Easter falls on the 25th of April, that is to say two days later than *Khidhi Elias* (St. George's) ; if the Lent begins on the 2nd of February, and intercalary years on the 3rd of February ; Easter falls on the 22nd March, 32 days before *Khidhi Elias* : the greatest distance between the two being 35 days.

#### SECTION VI. *Of the Coptic year.*

Add to the fundament of fundaments 342, the sum is the fundament of the Coptic year ; subtract it from the broken lunar year, and the rest will give the days of the Coptic year, the months of which are, *Thom* 30, *Poazhi* 30, *Hathor* 30, *Kihall* (*Khiak*) 30, *Tybi* 30, *Emsheer* (*Makhir*) 30, *Bermohat* (*Thamenoth*) 30, *Birmoode* (*Tharmatic*) 30, *Tasheesh* (*Takhon*) 30, *Tayni* 30, *Epiphi* 30, *Mesori* 30. If, for example, you wish to know on which day of the Coptic year falls the first of Ramazan of the year 961, add to the

fundament of fundaments of this year, which is 288, the number 342, subtract the sum 830 from the lunar broken year, which not being possible, you must add to it the solar year; the remaining 285 is the fundament of the Coptic year; subtract it if possible from the lunar year, and if it be not possible add to it the solar year; the number of the broken solar year is 237, the sum gives 802; subtract from it the Coptic fundament 165; the remaining 337 distribute amongst the above said months, giving to each 30 days, you will find the first Ramazan to fall on the 7th of *Mesori*.

#### SECTION VII. *Of the Persian year.*

The beginning of it is the *Yazdgerdian Nanrooz*; be it known that this *Nanrooz* falls regularly in the next year on the day of the week next to that with which it begun in the former, so if it begins this year with Monday it begins next with Tuesday, because there is no intercalary year in the *Yazdgerdian* cyclis. The way, of knowing it, is to throw away the hundred and odd number of the year of the *Hedjra*, and to multiply the rest with 11. Keep what you obtain and multiply it again with 11: add to one of these two products 53, and call this sum *Madjmoo*, divide the second with 30, subtract the quotient *Madjmoo*, from the number which remains beside; if the quotient is less than 19, you do not mind it, if it is greater than 19 you add it to the quotient, subtract the rest of the *Madjmoo* from the broken lunar year, and if this is not possible add to it the solar year; from the sum subtract the *Madjmoo*, the remaining number gives the day of the *Nanrooz*. For example—if you wish to know on which day of the *Yezdedjerdran* year falls the first of Ramazan of the year 961, you throw away the hundred and the odd number of the years of the *Hedjra*, multiply the remaining 80 with 11, which gives 660, add to the first 660 the number 93 which makes 713, and call this *Madjmoo*, divide the second 660 with 30, the quotient of which is 22; subtract this from the *Madjmoo*, and you will obtain 891; subtract of this the solar year and you will get 326. As it is impossible to subtract this sum from the broken lunar year you must add to this the solar, which makes 602, from which you subtract 326, the remaining 276 are the days of the *Yezdedjerdran* year, which you distribute according to the months *Farwarden* 30, *Ardebehesht* 30, *Khordad* 30, *Tir* 30, *Mordad* 30, *Shahirwer* 30, *Mihs*, 30 *Aben*, 30, *Azes*, 30, *Dei* 30, *Rahman* 30, *Isfendarmed* 30; and you will find the first Ramazan to fall on the tenth of *Dei*.





ART. V.—*Description of an Astronomical Instrument presented by RAJA RAM SING, of Khota, to the Government of India.*—By J. J. MIDDLETON, Esq. of the Hindoo College, Calcutta.

The instrument of which I am about to attempt a description, was presented some time ago by the Raja of Khota to the Government of India, as a very good specimen of its kind. The body of the instrument consists of a square plate of pure and massive silver, in addition to which, on one side, is a plummet or index-rod, which revolves freely in the vertical upon an axis fixed at one of the angles of the plate, and at the termination of a tube of about one-sixth of an inch in diameter, which runs the whole length of one side of the instrument. On the other side an index, consisting of four hands, at right angles to each other, and of nearly the radius of the plate, is screwed on to the centre of the plate, around which it revolves at pleasure. The drawings which accompany this description will render the above observations quite clear.

The Sanscrit inscription on the obverse of the plate, and occupying a triangular space at one of its angles, informs us at once of the class of instruments to which it belongs. The inscription may be rendered as follows—“In the year 1891 Sumbut, (1756) “Shokabdha, in the “month of Assar, on the 7th day of the moon, the son of Boidhanath, “constructed this astronomical instrument, in accordance with the “principles of an astronomical work, styled *Jontro Chintamony*, “under the direction of Raja Ram Sing of Khota, (blessings be upon “his head) who is an encourager of learned men.”

We learn from this, that the instrument is of very modern construction, a circumstance which however in no way detracts from its substantial interest, since it is not indebted, so far as I can discover, to modern principles of science, but might have been fabricated or used by the Indian astronomer of some thousand years ago. This, and the great rarity of astronomical instruments in India, at least in this part of it, contribute to it considerable importance. Of several learned Brahmins with whom I have consulted regarding the instrument, no one could give any account of it; indeed, with the exception of some unimportant facts, it was to them only a subject of astonishment; some, it is true, had read of such instruments in Bhascara, and other commentators on the Siddhants, but their notions of them, thus derived, were in the highest degree obscure. No additional fact is necessary to prove how rapidly Indian



astronomy is fading away in its native soil,—a decay which the Brahmins themselves readily admit; and which they attribute to the little encouragement held out to those who profess it. Although the relaxation of the grasp in which the Brahmins have long held the Indian mind, can be no subject of regret, and the discredit of their vaticinations no ground for lament; yet those who delight to trace the history of the human mind, and who contemplate with satisfaction the monuments of its industry and power, must ardently desire that Indian astronomy should be embalmed, as entire and perfect as possible, in scientific history. To effect this, the lover of science should allow no fact to escape him, being assured, that so soon as the sciences of the West have been diffused over India, so soon will Indian astronomy be but a name.

I shall begin my particular description of the instrument by showing its use in finding the time of the civil, or *bhūmi sávan*, day, which with the Indian extends from sunrise till sunset. For this purpose the inner quadrantal arc, described upon the obverse of the instrument, is graduated from right to left to fifteen prime divisions, these again being subdivided into six equal parts; the former being the number of *dundas* in half the Indian equinoctial day, and the latter being arcs of ten *pulaks* each, equal to four of our minutes. This will be rendered more plain by the following table of Indian divisions of time.

|                |   |                    |
|----------------|---|--------------------|
| 6 Respirations | = | 1 Vicala.          |
| 60 Vicala      | = | 1 Dunda.           |
| 60 Dundas      | = | 1 Nachshatrai day* |

In order to find the time of the day, the observer places the index rod upon its axis, which is fixed near one extremity of the tube, and raises the instrument in the vertical plane till he can see the sun through the tube; he now marks what part of the circle of time just described is cut by the rod, and reads off the number of hours and minutes, proximately, which the sun has of altitude, and this being added to the time of sunrise, or subtracted from that of sunset, (data which their almanacks supply) gives him the hour of the day. I need scarcely mention, that though the result is not strictly true even within the tropics, yet it is sufficiently so for the Indian astronomer, who diminishes its errors by compensations, a mode of correction to which he is accustomed, and in the application of which he is exceedingly skilful. The outer circle is an arc of the meridian intercepted between the equator and the pole, and is graduated to  $90^\circ$ , the divisions being num-

\* Nachshatrai day, the time of an entire revolution of the earth.

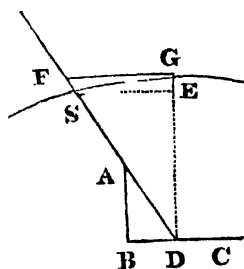
bered from left to right. By this, the index-rod being adjusted as in the last case, the zenith distance may be readily found; but when taken in connexion with other parts of the instrument, the latitude of places is also easily found. Before describing the manner in which this is done, however, it may be as well to enter into a brief exposition of the principles involved.

Of all the observations which the Indian astronomer makes, none are so generally important to him as those made with his gnomon and graduated horizontal plane, for any error committed here vitiates almost every calculation to which he is accustomed. When the practical imperfection of this instrument is considered, and the difficulty which the Indian artist has to encounter in its construction and adjustment from the rude tools he uses, it is a matter of much astonishment that he attains such accuracy as he will be presently seen to do.

Having fixed a conical gnomon perpendicularly upon a plane, which he graduates into *ungolas*, or digits, each equal to a twelfth part of the height of the gnomon, he again subdivides these into *beungols* or 60ths of an *ungol*. Thus provided, he proceeds at noon on the day of the equinox, to measure the length of the sun's shadow—an operation upon the accuracy of which depends his reputation as an astronomer. Having carefully ascertained the length of the shadow, he next proceeds to the determination of his latitude, which he effects in the following manner:—

Let A B be the gnomon, B C the graduated plane upon which the shadow is to be measured, S A D a ray from the sun S, then B D is the shadow.

Draw D G at right angles to B D, and upon it let fall the perpendicular S E, and from G draw G F perpendicular to D G.



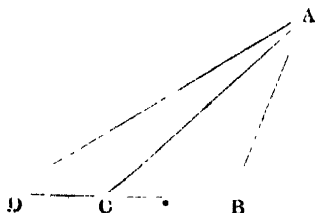
Then  $\sqrt{AB^2 + BD^2} = AD$  by the 47th of Euclid (a proposition well known to Indian mathematicians, and probably borrowed from them) and  $\frac{BD}{AD} = \frac{SE}{DS} =$  the sine of the zenith distance.

Indian mathematicians do not appear to have been acquainted with the nature and use of tangents; had they been so, they would cer-

tainly have used them in the present case, as their object would thereby have been less indirectly attained ; since  $\frac{BD}{AB} = \frac{GF}{DG} = \tan. \text{zen. dist.}$

These observations being premised, let us again return to the examination of the plate. It will be observed that its surface within the circles is crossed by equidistant straight lines, intersecting each other at right angles, and that at the twelfth division counting from the angle where the axis of the index-rod is placed along on the one side, the perpendicular has the points of intersection of the other lines numbered 1, 2, 3, 4, &c. If then the outer line thus intercepted by the line last mentioned be taken to represent the axis of the gnomon, the lines 1, 2, 3, 4, will represent the section of its shadow, and if the edge of the rod, adjusted as before, be brought over the number signifying the length of the shadow, that edge will also intercept a segment of the quadrant of latitude equal to the zenith distance. This will readily appear on inspection of the diagram just given. Thus the length of the shadow at any place being known, our instrument at once reveals the latitude.

The only use of this side of the instrument, so far as I can make out, which remains to be explained, is in the determination of heights and distances. To show its usefulness in this respect, little more will be necessary than to adduce an example of its application ; let  $AB$  be an inaccessible object standing on the horizontal plane  $BD$ , whose height is required.



Observe through the tube the summit  $A$ , and mark what division of the line 1, 2, 3, the index allowed to revolve freely on its axis intersects, and let that be, for example, at the number 12 ; then go backwards in a direct line from the object to any new station  $D$  and observe the summit of the object as before ; let us suppose that now the edge of the rod is found to intersect at the number 16, then we have  $16-12 : 16 :: DC : DB=4CD$

and  $16 : 4CD :: BA=3CD$ , the height required.

It is unnecessary to multiply examples, as from the one now given the readiness with which trigonometrical measurements of a simple kind may be effected without the introduction of angular functions, is sufficiently evident. As to the accuracy with which they can be performed, it may be perhaps sufficient to state that, after a little practice, I found

myself able to determine heights and distances with it with very great exactness.

Let us now turn our attention to the reverse side, where, by removing the revolving indices, we meet with numerous letters arranged around the centre in concentric zones, being an arrangement called *lotas*, the Indian metaphor of beauty, and a form peculiarly favoured of Indian sages.

The numbers 1, 2, 3, 4, it will be observed, are written exterior to the outer circle, and indicate the beginning of the four slokes which make up the figure; the three first being read across, and constituting diameters to the outer circle, the fourth forming the outer circle itself. The following is a translation.

'The length of the shadow of the gnomon at Khota is five ungols and 30 beaugols, in consequence of which the elevation of the signs above the horizon takes place there in times the particulars of which are as follow—

|         |   |         |    |        |
|---------|---|---------|----|--------|
| Aries,  | 3 | Dundas, | 43 | Pulas. |
| Taurus, | 4 | „       | 15 | „      |
| Gemini, | 5 | „       | 5  | „      |
| Cancer, | 5 | „       | 41 | „      |
| Leo,    | 5 | „       | 43 | „      |
| Virgo,  | 5 | „       | 33 | „      |

'But the other six signs, namely Libra, Scorpio, Sagittarius, Capricornus, Aquarius, and Pisces, are in point of rising above the horizon equal to the former six, when taken in inverse order; that is to say, 'Libra rises in the same time as Virgo, and so on.'

The length of the shadow here given is not quite correct,\* at least if I may credit, which I have good reason to do, the result of Mr. Hunter's computations, published in the fourth volume of the Asiatic Researches. According to that careful observer, the latitude of Khota is  $25^{\circ} 11' 41''$ , while the datum of the instrument gives but  $24^{\circ} 37' 25''$ , which, notwithstanding some corrections which I shall presently make, still leaves the latter in defect.

The difference between the latitude of Khota, as calculated by Mr. Hunter, and that deduced from the Indian datum is,  $34' 16''$ ; this is considerable, and is perhaps not entirely attributable to imperfection of instruments or carelessness of observation, but to the

\* The same length of shadow 5 a 30 b is the same as that supposed in the Bhagul-pore tables given by Le Gentil. In both cases the number is suspiciously round, and in both also somewhat inaccurate.

omission of certain elements which the European astronomer takes into account. But little familiarity with astronomy is necessary to an apprehension of the fact that, whatever apparently elevates the sun above his true position must, in the same ratio, diminish the shadow of the gnomon, and consequently the latitude thence deduced. Now refraction does this to a small extent, and the rays of light from the sun's upper limb cause a much greater error of the same kind.

Making the necessary corrections, we have

|                     |    |    |    |     |        |
|---------------------|----|----|----|-----|--------|
| Difference,         | .. | .. | —  | 34' | 16"    |
| Refraction,         | .. | .. | .. | +   | 26"    |
| Sun's semidiameter, | .. | .. | .. | +   | 16' 4" |
| <hr/>               |    |    |    |     |        |
| True difference,    | .. | .. | —  | 17' | 46"    |

This is, as I doubt not will be generally allowed, a difference astonishingly small, considering the imperfection of the instrument employed in observation.

Before entering on the examination of the Table of Ascensions of the Signs as given above, it may be as well to inform the reader that after having ascertained the occurrence of any celestial phenomenon, such as an eclipse for instance, in sidereal time, the astronomer next converts this into civil time ; to do which it is necessary that he should know how long each sign occupies in rising. This he effects in the following manner:—

Let us take for example the sign Aries, the place Khota, the length of the equinoxial shadow, as it is given to us, 5 ungols and 30 beungols, and the obliquity of the ecliptic  $24^{\circ}$

1 : Sin 24 :: Sin 30 : Sin decl.

9.6093133

9.6989700

---

9.3082833

12 : 5.5 :: Sin decl. : Chitija

8.9207188

0.7603627

9.7082833

---

8.9693648

Cos. decl. : 1 : : Chitija : Sin chara  
 0.0091609  
 8.9693648

---

8.9785257 =  $5^{\circ} 28'$  nearly,—ascensional diff.

Again, the Lugna of Lanca. or right ascension, is,

+  $17^{\circ} 50'$   
 ra —  $5^{\circ} 28'$

---

Gives  $22^{\circ} 22'$  the ascension of the sign Aries at Khota, which being reduced to Dundas gives us  $\frac{22.366}{6} = 3.726 = 3$  dundas 43 pulas nearly, as given on the plate, notwithstanding that my calculations have been performed with logarithms; a sufficient proof, if proof were needed, that where care can save him from error the Indian astronomer is not wanting. It will be seen that I have assumed the obliquity of the ecliptic to have been estimated at  $24^{\circ}$ , which assumption gives me the true result; this supports the statement made in the beginning of this article, that the instrument is not beholden to modern science for the principles of its construction. Calculating by spherical trigonometry, and assuming the same obliquity, I obtain 3 dundas and 40 pulas for the ascensional arc, giving a difference in time of 3 pulas, or about one of our minutes; an error so small, that even were the Indian astronomer aware of its existence he would disregard it, satisfied that the practical purposes which his labours subserve, are, notwithstanding, carried out with sufficient accuracy.

The zones which bound this side of the instrument alone remain to be explained. There are two of them, with their subordinate circles, the inner serving for an hour circle, the outer for the *Bhagana* or zodiac. It will be observed that in the latter the signs are arranged in pairs, and are referred to the hour circle, of which they occupy segments proportioned to their times of ascension, as given above, while the pairs whose ascensional arcs are equal, are classed together: viz. Mesha and Minah, (Aries and Pisces) Brisha and Khumbo (Taurus and Aquarius) and so on. The whole zodiac thus occupies an equatorial arc of 12 hours, or 30 dundas.

Indian astronomers divide their zodiac in the same manner as those of Europe, and have equivalent names for their signs, as appears in the following table.

*Divisions of the Zodiac.*

|            |   |         |           |   |            |
|------------|---|---------|-----------|---|------------|
| 60 Vicalas | = | 1 Cala  | 30 Bhagas | = | 1 Rasi     |
| 60 Calas   | = | 1 Bhaga | 12 Rasis  | = | 1 Bhagana. |

*Names and order of the Signs.*

|          |      |            |          |                 |
|----------|------|------------|----------|-----------------|
| Mesha    | .... | The Ram    | Toulah   | The Balance     |
| Brisha   | .... | The Bull   | Brishika | The Scorpion    |
| Mithouna | ..   | The Twins  | Dhanou   | The Archer      |
| Corcota  | .... | The Crab   | Mocora   | The Sea-monster |
| Singha   | .... | The Lion   | Coumbho  | The Pitcher     |
| Cunya    | .... | The Virgin | Meena    | The Fishes      |

This is a remarkable fact, and in itself a strong argument against the opinion entertained by some, that the boasted antiquity of Indian astronomy owes its rise to imposture practised by the Brahmins; since it is inconceivable that men capable of perfecting so astonishing a system would have permitted a coincidence so striking, and so encouraging to envy or suspicion, to continue.

The revolving indices, although they might serve the astronomer to illustrate the revolution of the colures, were more probably intended to assist the astrologer in the partition of the celestial concave—an early and important process in the investigation of destiny.

I must not quit this subject without expressing my grateful acknowledgments to Bishonath Turkabhooshuna and Jogodhan Missi, two learned Pundits of this city, for their valuable assistance in translation of the inscriptions.

ART. VI.—*Extract from a Memoir on the Preparations of the Indian Hemp, or Gunjah, (Cannabis Indica) their effects on the Animal system in Health, and their utility in the Treatment of Tetanus and other Convulsive Diseases.*—By. W. B. O'SHAUGHNESSY, M. D. Professor in the Medical College of Calcutta, &c. &c.

(Continued from page 745.)

## SECTION V.

*Experiments by the author—inferences as to the action of the drug on animals and man.*

Such was the amount of preliminary information before me, by which I was guided in my subsequent attempts to gain more accurate knowledge of the action, powers, and possible medicinal applications of this extraordinary agent.

There was sufficient to show that Hemp possessed in small doses an extraordinary power of stimulating the digestive organs, exciting the cerebral system, of acting also on the generative apparatus. Larger doses, again, were shewn by the historical statements to induce insensibility, or to act as a powerful sedative. The influence of the drug in allaying pain was equally manifest in all the memoirs referred to. As to the evil sequelæ so unanimously dwelt on by all writers, these did not appear to me so numerous, so immediate, or so formidable, as many which may be clearly traced to over-indulgence in other powerful stimulants or narcotics, viz. alcohol, opium, or tobacco.

The dose in which the Hemp preparations might be administered, constituted of course one of the first objects of inquiry. Ibn Beitar had mentioned a *direm*, or 48 grains of *Churrus*, but this dose seemed to me so enormous, that I deemed it expedient to proceed with much smaller quantities. How fortunate was this caution, the sequel will sufficiently denote.

An extensive series of experiments on animals, was in the first place undertaken, among which the following may be cited :

*Expt. 1.*—Ten grains of Nipalese *Churrus*, dissolved in spirit, were given to a middling sized dog. In half an hour he became stupid and sleepy, dozing at intervals, starting up, wagging his tail as if extremely contented, he ate some food greedily, on being called to he staggered to and fro, and his face assumed a look of utter and helpless drunkenness. These symptoms lasted about two hours, and then gradually passed away ; in six hours he was perfectly well and lively.

*Expt. 2.*—One drachm of *Majoom* was given to a small sized dog, he ate it with great delight, and in twenty minutes was ridiculously drunk ; in four hours his symptoms passed away, also without harm.

*Expts. 3, 4, & 5.*—Three kids had ten grains each of the alcoholic extract of *Gunjah*. In one no effect was produced ; in the second there was much heaviness, and some inability to move ; in the third a marked alteration of countenance was conspicuous, but no further effect.

*Expt. 6.*—Twenty grains were given, dissolved in a little spirit, to a dog of very small size. In a quarter of an hour he was intoxicated ; in half an hour he had great difficulty of movement ; in an hour he had lost all power over the hinder extremities, which were rather stiff, but flexible ; sensibility did not seem to be impaired, and the circulation was natural. He readily acknowledged calls by an attempt to rise up. In four hours he was quite well.



In none of these or several other experiments was there the least indication of pain, or any degree of convulsive movement observed.

It seems needless to dwell on the details of each experiment ; suffice it to say, that they led to one remarkable result—That while carnivorous animals and fish, dogs, cats, swine, vultures, crows, and adjutants, invariably and speedily exhibited the intoxicating influence of the drug, the graminivorous, such as the horse, deer, monkey, goat, sheep, and cow, experienced but trivial effects from any dose I administered.

Encouraged by these results, no hesitation could be felt as to the perfect safety of giving the resin of Hemp an extensive trial in the cases in which its apparent powers promised the greatest degree of utility.

#### ~~~~~ *Cases of Rheumatism treated by Hemp.*

The first cases selected were two of acute rheumatism, and one of that disease in the chronic form. In the two former but little relief had been derived from a fair trial of antiphlogistic measures, and Dover's powder with antimonials—In the last case, sarsaparilla at first, and subsequently the Hemidesmus Indicus with warm baths had been tried without advantage.

On the 6th November, 1838, one grain of the resin of Hemp was administered in solution, at 2 p. m. to each of these three patients.

At 4 p. m. it was reported that one was becoming very talkative, was singing songs, calling loudly for an extra supply of food, and declaring himself in perfect health. The other two patients remained unaffected.

At 6 p. m. I received a report to the same effect, but stating that the first patient was now falling asleep.

At 8 p. m. I was alarmed by an emergent note from Nobinchunder Mitter, the clinical clerk on duty, desiring my immediate attendance at the Hospital, as the patient's symptoms were very peculiar and formidable. I went to the Hospital without delay, and found him lying on his cot quite insensible, but breathing with perfect regularity, his pulse and skin natural, and the pupils freely contractile on the approach of light.

Alarmed and pained beyond description at such a state of things, I hurried to the other patients—found one asleep, the third awake, intelligent, and free from any symptoms of intoxication or alarm.

Returning then to the first, an emetic was directed to be prepared, and while waiting for it I chanced to lift up the patient's arm. The professional reader will judge of my astonishment, when I found that it remained in the posture in which I placed it. It

required but a very brief examination of the limbs to find that the patient had by the influence of this narcotic been thrown into that strange and most extraordinary of all nervous conditions, into that state which so few have seen, and the existence of which so many still discredit—the genuine *catalepsy* of the nosologist.\*

It had been my good fortune years before to have witnessed two unequivocal cases of this disorder. One occurred in the female clinical ward in Edinburgh, under Dr. Duncan's treatment, and was reported by myself for the *Lancet* in 1828. The second took place in 1831, in a family with whom I resided in London. The case was witnessed by Dr. Silver, Mr. G. Mills, and several other professional friends. In both these cases the cataleptic state was established in full perfection, and in both the paroxysm ran on each occasion a regular course, and terminated suddenly without any evil consequence.

To return to our patient, we raised him to a sitting posture, and placed his arms and limbs in every imaginable attitude. A waxen figure could not be more pliant or more stationary in each position, no matter how contrary to the natural influence of gravity on the part.

To all impressions he was meanwhile almost insensible; he made no sign of understanding questions; could not be aroused. A sinapism to the epigastrium caused no sign of pain. The pharynx and its coadjutor muscles acted freely in the deglutition of the stimulant remedies which I thought it advisable to administer, although the manifest cataleptic state had freed me altogether of the anxiety under which I before laboured.

The second patient had meanwhile been roused by the noise in the ward, and seemed vastly amused at the strange aspect of the statuelike attitudes in which the first patient had been placed, when on a sudden he uttered a loud peal of laughter, and exclaimed that four spirits were springing with his bed into the air. In vain we attempted to pacify him; his laughter became momentarily more and more uncontrollable. We now observed that the limbs were rather rigid, and in a few minutes more his arms or legs could be bent, and would remain in any desired position. A strong stimulant drink was immediately given, and a sinapism applied. Of the latter he made no complaint, but his intoxication led him to such noisy exclamations, that we had to remove him to a separate room; here he soon became tranquil, his limbs

\* The subject of the celebrated Article in Blackwood, the "Thunder-struck" of the *Diary of a late Physician*.

in less than an hour gained their natural condition, and in two hours he experienced himself perfectly well and excessively hungry.

The first patient continued cataleptic till 1 A. M., when consciousness and voluntary motion quickly returned, and by 2 A. M. he was exactly in the same state as the second patient.

The third man experienced no effect whatever, and on further inquiry, it was found that he was habituated to the use of *Gunjah* in the pipe.

On the following day it gave me much pleasure to find that both the individuals above mentioned were not only uninjured by the narcotic, but much relieved of their rheumatism; they were discharged quite cured in three days after.

The fourth case of trial was an old muscular cooly, a rheumatic malingerer, and to him half a grain of Hemp resin was given in a little spirit. The first day's report will suffice for all.—In two hours the old gentleman became talkative and musical, told several stories, and sang songs to a circle of highly delighted auditors, ate the dinners of two persons subscribed for him in the ward, sought also for other luxuries I can scarcely venture to allude to, and finally fell soundly asleep, and so continued till the following morning. On the noon-day visit, he expressed himself free from headache or any other unpleasant sequel, and begged hard for a repetition of the medicine, in which he was indulged for a few days, and then discharged.

In several cases of acute and chronic rheumatism admitted about this time, half-grain doses of the resin were given, with closely analogous effects;—alleviation of pain in most—remarkable increase of appetite in all—unequivocal aphrodisia, and great mental cheerfulness. In no one case did these effects proceed to delirium, or was there any tendency to quarrelling. The disposition developed was uniform in all, and in none was headache or sickness of stomach a sequel of the excitement.

#### ~~~~~ *Case of Hydrophobia.*

A case now occurred in which the influence of a narcotic, capable either of cheering or of inducing harmless insensibility, would be fraught with blessings to the wretched patient.

On the 22nd November at 8 A. M. a note in English was handed to me by my servant, entreating my assistance for the Hakim Abdullah, then at my gate, who had been bitten by a rabid dog three weeks before, and who feared that the miserable consequences of the bite al-

ready had commenced. I found the poor man in a carriage; he was perfectly composed, though quite convinced of the desperate nature of his case. He told me that the evening before, on passing near a tank he started in alarm, and since then was unable to swallow liquid. His eye was restless, suspicious, and wild, his features anxious, his pulse 125, his skin bedewed with cold moisture; he stated nevertheless that he wished for food and felt well;—a small red and painful cicatrix existed on the left fore-arm.

He was immediately removed to the Hospital, where I accompanied him. By his own desire water was brought in a metallic vessel, which he grasped and brought near his lips;—never can I forget the indescribable horrors of the paroxysm which ensued. It abated in about three minutes, and morbid thirst still goading the unhappy man, he besought his servant to apply a moistened cloth to his lips. Intelligent and brave, he determinately awaited the contact of the cloth, and for a few seconds, though in appalling agony, permitted some drops to trickle on his tongue,—but then ensued a second struggle, which, with a due share of the callousness of my profession, I could not stand by to contemplate.

Two grains of Hemp resin in a soft pillular mass were ordered every hour; after the third dose he stated that he felt commencing intoxication—he now chatted cheerfully on his case, and displayed great intelligence and experience in the treatment of the very disease with which he was visited. He talked calmly of drinking, but said it was in vain to try—but he could suck an orange; this was brought to him, and he succeeded in swallowing the juice without any difficulty.

The Hemp was continued till the sixth dose, when he fell asleep, and had some hours rest. Early the ensuing morning, however, Mr. Siddons, my assistant, was called up to him, and found him in a state of tumultuous agony and excitement; tortured by thirst he attempted to drink,—but I will spare the reader the details of the horrors which ensued.

The Hemp was again repeated, and again by the third dose the cheering alleviation of the previous day was witnessed. He ate a piece of sugar-cane, and again swallowed the juice—he partook freely of some moistened rice, and permitted other necessary remedies to be used. His pulse was nearly natural, the skin natural in every respect. His countenance was happy. On *one* subject only was he incoherent, and even here was manifested the powerful and peculiar influence of the narcotic. He spoke in raptures of the inmates of his *zenana*, and his anxiety to be with them. We ascertained however that he had no such establishment.

Four days thus passed away, the doses of Hemp being continued. When he fell asleep on waking the paroxysms returned, but were again almost immediately assuaged as at first. Meanwhile purgative enemata were employed, and he partook freely of solid food, and once drank water without the least suffering. But about 3 p. m. of the fifth day he sunk into profound stupor, the breathing slightly stertorous; in this state he continued, and without further struggle death terminated his sufferings at 4 a. m., on the 27th November.

Reviewing the preceding summary of this interesting case, it seems evident that at least one advantage was gained from the use of the remedy—the awful malady was stripped of its horrors;—if not less fatal than before, it was reduced to less than the scale of suffering which precedes death from most ordinary diseases. It must be remembered too that in this the first case ever so treated, I possessed no data to guide me as to the dose or manner of administration of the drug. The remarkable cases of tetanus detailed in the sequel, throw light on these important points, and will lead in future cases to the unhesitating administration of much larger quantities than at first I ventured to employ. I am not however rash enough to indulge the hope which involuntarily forces itself upon me, that we will ever from this narcotic derive an effectual remedy, for even a solitary case of this disease—but next to cure, the physician will perhaps esteem the means which enable him “to strew the path to the tomb with flowers,” and to divest of its *specific* terrors the most dreadful malady to which mankind is exposed.

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While the preceding case was under treatment, and exciting the utmost interest in the school, several pupils commenced experiments on themselves, to ascertain the effects of the drug. In all, the state of the pulse was noted before taking a dose, and subsequently the effects were observed by two pupils of much intelligence. The result of several trials was, that in as small doses as the quarter of a grain, the pulse was increased in fulness and frequency; the surface of the body glowed; the appetite became extraordinary; vivid ideas crowded the mind; unusual loquacity occurred; and with scarcely any exception, great aphrodisia was experienced.

In one pupil, Dinonath Dhur, a retiring lad of excellent habits, ten drops of the tincture, equal to a quarter of a grain of the resin, induced in twenty minutes the most amusing effects I ever witnessed. A shout of laughter ushered in the symptoms, and a transitory state of

cataleptic rigidity occurred for two or three minutes. Summoned to witness the effects, I found him enacting the part of a Raja giving orders to his courtiers; he could recognize none of his fellow students or acquaintances; all to his mind seemed as altered as his own condition; he spoke of many years having passed since his student's days; described his teachers and friends with a piquancy which a dramatist would envy; detailed the adventures of an imaginary series of years, his travels, his attainment of wealth and power. He entered on discussions on religious, scientific, and political topics, with astonishing eloquence, and disclosed an extent of knowledge, reading, and a ready apposite wit, which those who knew him best were altogether unprepared for. For three hours and upwards he maintained the character he at first assumed, and with a degree of ease and dignity perfectly becoming his high situation. A scene more interesting it would be difficult to imagine. It terminated nearly as rapidly as it commenced, and no headache, sickness, or other unpleasant symptom followed the innocent excess.

In the symptoms above described we are unavoidably led to trace a close resemblance to the effects produced by the reputed inspiration of the Delphic Oracles—perhaps it would not be very erroneous to conclude, that it was referable to the same kind of excitement.

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*Use in Cholera.*

An epidemic cholera prevailing at this period, two of the students administered the tincture of Hemp in several cases of that disease, and cures were daily reported by its alleged efficacy. Dr. Goodeve was thus led to try it in several cases, and his report was in the highest degree favorable. The diarrhoea was in every instance checked, and the stimulating effects of the drug clearly manifested. The Durwan of the College, an athletic Rajpoot, was attacked, and came under my treatment after he had been ill seven hours; he was pulseless, cold, and in a state of imminent danger, the characteristic evacuations streaming from him without effort—half a grain of the Hemp resin was given, and in twenty minutes the pulse returned, the skin became warm, the purging ceased, and he fell asleep. In an hour he was cataleptic, and continued so for several hours. In the morning he was perfectly well and at his duty as usual.

It is but fair to state, however, that the character of the epidemic was not at the time malignant. I admit the cases to be inconclusive, but I conceive them to be promising, and that they deserve the due attention of the practitioner.\*

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#### *Use in Tetanus.*

I now proceed to notice a class of most important cases, in which the results obtained are of the character which warrants me in regarding the powers of the remedy as satisfactorily and incontrovertably established. I allude to its use in the treatment of traumatic *tetanus*, or lock-jaw, next to hydrophobia, perhaps the most intractable and agonizing of the whole catalogue of human maladies.

The first case of this disease treated by Hemp was that of Ramjan Khan, æt : 30, admitted to the College Hospital on the 13th December 1838, for a sloughing ulcer on the back of the left hand. Five days previously a native empiric had applied a red hot *gool* (the mixture of charcoal and tobacco used in the hookah) to the back of the left wrist, as a remedy for chronic dysentery and spleen. The patient's brother was similarly cauterized on the same day. In both sloughing took place down to the tendons. Symptoms of tetanus occurred on the 24th December. The brother who had refused to avail himself of European aid, had been seized with tetanus at his own home four days previously, and died after three days illness. On the 26th of December spasms set in, and recurred at intervals of a few minutes ; the muscles of the abdomen, neck, and jaws, became firmly and permanently contracted. Large doses of opium with calomel having been administered for some hours, without the least alleviation of symptoms, and his case having on consultation been pronounced completely hopeless, I obtained Dr. Egerton's permission to subject the poor man to the trial of the Hemp resin. Two grains were first given at 2½ p. m., dissolved in a little spirit. In half an hour the patient felt giddy, at 5 p. m. his eyes were closed, he felt sleepy, and expressed himself much intoxicated.

He slept at intervals during the night, but on waking had convulsive attacks.

\* Since this paper was read at the Medical Society a severe epidemic cholera has broken out in Calcutta. I have treated seven cases in the Medical College Hospital, and in all the pulse and warmth returned from the use of this remedy. Five recovered, but all passed through a fever stage.—W. B. O'S.

On the 27th, two grains\* were given every third hour, (a purgative enema was also administered, which operated three times) the stiffness of the muscles became much less towards evening, but the spasms returned at intervals as before. Pulse and skin natural.

28th.—Improved ; is lethargic but intelligent. Spasms occasionally recur, but at much longer intervals, and in less severity.

29th.—Dose of Hemp increased to three grains every second hour. Symptoms moderating.

30th.—Much intoxicated, continues to improve.

1st January, 1839.—A Hemp cataplasm applied to the ulcer, and internal use of remedy continued ; towards evening was much improved ; spasms trivial, no permanent rigidity, Dysentery has returned.

2nd.—*Morning report.* Has passed a good night, and seems much better. Hemp continued. *Evening report.* Doing remarkably well.

3rd, 4th, and 5th.—Continues to improve. Hemp resin in two grain doses every fifth hour.

6th.—5 p. m. Feverish, skin hot, pulse quick, all tetanic symptoms gone. Dysentery urgent.

From this day the tetanus may be considered to have ceased altogether, but the dysenteric symptoms continued, despite of the use of opium and acetate of lead ; the ulcer too proved utterly intractable. Some improvement in the dysenteric symptoms occurred from the 10th to the 15th. He seemed gaining strength, but the wound was in no wise improved, the slough on the contrary threatened to spread, and two metacarpal bones lay loose in the centre of the sore ; on consultation it was agreed to amputate the arm, but to this the patient peremptorily objected. The mortification now spread rapidly, and to our infinite regret he died of exhaustion on the night of the 23rd January.

An unprejudiced review of the preceding details exhibits the sedative powers of the remedy in the most favorable light ; and although the patient died, it must be remembered that it was of a different disease, over which it is not presumed that the Hemp possesses the least power.

The *second case* was that of Chunoo Syce, (treated by Mr. O'Brien at the Native Hospital) in whom tetanus supervened on the 11th December, after an injury from the kick of a horse. After an ineffectual trial of turpentine and castor oil in large doses, two grain doses of Hemp resin were given on the 26th November. He consumed in all 134 grains of the resin, and left the Hospital cured on the 28th December.



*Third case.*—Huroo, a female, æt: 25, admitted to the Native Hospital on 16th December, had tetanus for the three previous days, the sequel of a cut on the left elbow received a fortnight before. Symptoms violent on admission. Turpentine and castor oil given repeatedly without effect; on the 16th and 17th, three grains of Hemp resin were given at bed-time. On the morning of the 18th she was found in a state of complete catalepsy, and remained so until evening, when she became sensible, and a tetanic paroxysm recurred. Hemp resumed, and continued in two grain doses every fourth hour. From this time till the third hour tetanic symptoms returned. She subsequently took a grain twice daily till the 8th of February, when she left the Hospital apparently quite well.

Mr. O'Brien has since used the Hemp resin in five cases, of which four were admitted in a perfectly hopeless state. He employed the remedy in *ten grain doses* dissolved in spirit. The effect he describes as almost immediate relaxation of the muscles and interruption of the convulsive tendency. Of Mr. O'Brien's seven cases, four have recovered.

In the Police Hospital of Calcutta, the late Dr. Bain has used the remedy in three cases of traumatic tetanus, of these one has died and two recovered.

A very remarkable case has recently occurred in the practice of my cousin, Mr. Richard O'Shaughnessy. The patient was a Jew, æt: 30, attacked with tetanus during the progress of a sloughing sore of the scrotum, the sequel of a neglected hydrocele. Three grain doses were used every second hour, with the effect of inducing intoxication and suspending the symptoms. The patient has recovered perfectly, and now enjoys excellent health.

Besides the preceding cases I have heard of two of puerperal trismus thus treated in native females. Both terminated fatally, an event, which cannot discredit the remedy, when it is remembered that the Hindoo native females of all ranks are placed during and subsequent to their confinement in a cell within which large logs of wood are kept constantly ignited. The temperature of these dens I have found to exceed 120° of Fahrenheit's scale.

The preceding facts are offered to the professional reader with unfeigned diffidence, as to the inferences I feel disposed to derive from their consideration. To me they seem unequivocally to shew, that when given boldly and in large doses, the resin of Hemp is capable of

arresting effectually the progress of this formidable disease, and in a large proportion of cases of effecting a perfect cure.

The facts are such at least as justify the hope that the virtues of the drug may be widely and severely tested in the multitudes of these appalling cases which present themselves in all Indian Hospitals.

*Delirium occasioned by continued Hemp Inebriation.*

Before quitting this subject, it is desirable to notice the singular form of delirium which the incautious use of the Hemp preparations often occasions, especially among young men who try it for the first time. Several such cases have presented themselves to my notice. They are as peculiar as the "delirium tremens," which succeeds the prolonged abuse of spirituous liquors, but are quite distinct from any other species of delirium with which I am acquainted.

This state is at once recognized by the strange balancing gait of the patient, a constant rubbing of the hands, perpetual giggling, and a propensity to caress and chafe the feet of all bystanders of whatever rank. The eye wears an expression of cunning and merriment which can scarcely be mistaken. In a few cases, the patients are violent; in many, highly aphrodisiac; in all that I have seen, voraciously hungry. There is no increased heat or frequency of circulation, or any appearance of inflammation or congestion, and the skin and general functions are in a natural state.

A blister to the nape of the neck, leeches to the temples, and nauseating doses of tartar emetic with saline purgatives have rapidly dispelled the symptoms in all the cases I have met with, and have restored the patient to perfect health.

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The preceding cases constitute an abstract of my experience on this subject, and which has led me to the belief that in Hemp the profession has gained an anti-convulsive remedy of the greatest value. Entertaining this conviction, be it true or false, I deem it my duty to publish it without any avoidable delay, in order that the most extensive and the speediest trial may be given to the proposed remedy. I repeat what I have already stated in a previous paper—that were individual reputation my object, I would let years pass by, and hundreds of cases accumulate before publication; and in publishing I would enter into every kind of elaborate detail. But the object I have proposed to myself in these inquiries is of a very different kind. To gather together a few strong facts, to ascertain the limits which cannot

be passed without danger, and then pointing out these to the profession, to leave their body to prosecute and decide on the subject of discussion,—such seems to me the fittest mode of attempting to explore the medicinal resources which an untried *Materia Medica* may contain.

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It may be useful to add a formula for making the preparations which I have employed.

The *resinous extract* is prepared by boiling the rich, adhesive tops of the dried *Gunjah* in spirit (Sp: gr. 835,) until all the resin is dissolved. The tincture thus obtained is evaporated to dryness in a vessel placed over a pot of boiling water. The extract softens at a gentle heat, and can be made into pills without any addition.

The *tincture* is prepared by dissolving three grains of the extract in one drachm of proof spirit.

Doses, &c.—In *Tetanus* a drachm of the tincture every half hour until the paroxysms cease, or catalepsy is induced. In *Hydrophobia* I would recommend the resin in soft pills, to the extent of ten to twenty grains, to be chewed by the patient, and repeated according to the effect. In *Cholera* ten drops of the tincture every half hour will be often found to check the vomiting and purging, and bring back warmth to the surface. My experience would lead me to prefer *small* doses of the remedy in order to excite rather than narcotise the patient.

Postscript.

While the proofs of this paper were under correction, Dr. Esdaile, of Hooghly, has communicated a case of traumatic tetanus, in which he has used the extract of Hemp and the patient recovered. The details will be subsequently published.

Mr. Sawers, the 1st Member of the Medical Board, has also favored me with the results of a very curious trial of the remedy on a pony which had been attacked by lockjaw as the sequel of forcible compression of the testes. I have the pleasure to insert an extract from Mr. Sawers' note.

“ Having made no memorandum of the case of the pony, I am unable to give the particulars in detail. Before the *Bhang* was given the power of mastication had ceased for several days, and he had been supported by mixing *suttoo* (pounded pulse) and bran with his water; with this the powdered *Bhang* was mixed. When he had taken some doses the general rigidity of the muscles was in some degree removed, and he began to masticate hay and grass, and shortly was able to lie down and rise without assistance; but it was sometime ere he recovered the power of balancing the muscles so as to trot evenly.

"I direct the syce to give a little more of the *Bhang* than it was usual for a stout man to take for a *dose*, and it was given for eight or ten days, perhaps longer.

"The pony is now perfectly well. The disease was induced by compression of the spermatic chord, as a mode of castration. *Tetanus* is not so fatal in the horse as in man; of the former I have known several instances of recovery, of the latter, in all my experience I have seen but one case which did not terminate fatally.

"After the battle of Laswarry several wounded Europeans and Sepoys were received into the Hospitals at Agra with *Tetanus*, but they all died. A Sepoy who had a large wound on the outside of his right thigh (which had been brushed by a cannon ball, removing the integuments,) was seized with lock-jaw a few days after his arrival. The only medicines he took were pills of opium and calomel, which he took in large quantity, with occasional aperients;—he recovered. The disease came on gradually, and for many days his jaws were so clenched that the small pills could only be administered by an opening between two of his teeth.

"I ought to have stated that the pony had enemata daily whilst taking the *Bhang*.

Signed, "J. SAWERS."

ART. VII.—*Memorandum of Experiments on the Explosion of Gunpowder under Water by the Galvanic Battery; with a notice of the successful destruction of the wreck of the "Equitable," at Fultah Reach.*—By W. B. O'SHAUGHNESSY, M.D. Assistant Surgeon, &c. &c.

HAVING recently undertaken a series of experiments on the application of the Galvanic Battery to the explosion of gunpowder under water, with reference to the destruction of the wreck of the barque "Equitable," sunk in the channel of the Hooghly at Fultah Reach, I think it desirable to publish a succinct statement of the results to which these experiments have led.

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*Description of the Galvanic Battery.*

The galvanic battery which I employed in my experiments is one of my own construction, but on Daniell's constant principle. It consists

of a series of rectangular copper cells, (water-tight) fifteen inches square, and the sides three-fourths of an inch apart. To one lip of the cell is soldered a small copper tube *a* (water-tight) in which a few drops of mercury are contained. One of these cells is shewn in the plate, fig. 1.

Each copper cell is provided with a sheet of zinc plate, fourteen and a half inches square, to which a thick copper wire, seven inches long, is firmly soldered. Each zinc plate is amalgamated with mercury, and enclosed in a pasteboard case, the construction of which deserves attention, as upon it depends much of the action of the battery.

Two sheets of brown pasteboard are cut, of such dimensions that they will freely slide into the copper cells. The pasteboards are then placed over each other, and their edges fastened together at three sides by thin slips of teak, half an inch wide, bound together by a few copper screws. A case or bag of this kind when well made is water-tight at the joints, but allows slow filtration to take place through its sides. One of these cases is shewn at fig. 2.

To arrange each cell the zinc sheet is introduced into the pasteboard case, and this into the copper cell.

Twelve of these cells constitute what we may term one division. The cells must not touch, and are accordingly separated by slips of wood. The zinc sheet from cell No. 1 is connected by its wire with the copper cell No. 2, the zinc of 2 with the copper of 3, and so on, as shewn in fig. 4, in which twelve are placed in a box together.

To excite the battery two different solutions are employed, one a solution of blue-stone (sulphate of copper, *nīla tutiya*). This salt costs in the Calcutta bazars about twenty-two rupees per maund.

The second solution is made of sulphate of soda, (Glauber salt, *Kari nimuk*), dissolved in warm water, and allowed to cool before use.

Each copper cell is to be filled to two-thirds of its depth with the blue liquid. The pasteboard cases with their zinc sheets are to be steeped in the Glauber salt solution till thoroughly soaked, then slipped into the copper cells, and filled up with the same liquid. The battery is then ready for use.

*Igniting effect produced on platinum or iron wire ; how influenced by distance and thickness of conductors, and length of platinum wire.*

I abstain from all explanation as to the theory or mode of action of this battery, wishing to confine myself here to its effects in the ignition of metallic wires.

To produce this effect, twist a copper bell-wire ten feet long to the wire of the last zinc plate, and connect a similar wire with the mercury tube of the first copper cell. If the free ends of these wires be joined by a fine platinum or iron wire, say two inches in length, the moment the junction is completed the platinum or iron becomes white hot, and if the battery be in full action, generally melts into numerous globules. The ready destructibility of iron by oxidation renders it inferior for the purpose now in view to platinum, which was accordingly used in all the subsequent experiments.

But if the copper wires touch each other in any part between the battery and the platinum no heating is produced, because the electrical action does not extend beyond the first metallic junction. This most important fact is made use of in a self-acting apparatus which I employ for the explosion of mines at a certain fixed time after the experimentalist has retired to a safe distance.

It also shews, that when we wish to produce ignition of platinum wire at a distance we must take some means for preventing the conductors from touching each other. But before describing how this may best be accomplished, it is necessary to examine the influence of two important circumstances over the ignition of the platinum wire, viz. the thickness of the conductors, and the distance of the platinum wire from the battery. A few experiments will render this quite intelligible.

A constant battery of twelve cells was employed, and a platinum wire two inches long and 1-30th of an inch in diameter.

*1st Experiment.*—Using copper bell-wire 1-12th of an inch in diameter, this battery caused the platinum wire to become so hot as to kindle saltpetre match-paper at a distance of 130 feet.

*2nd Experiment.*—Each conductor was formed of two strands of bell-wire. The platinum was now heated to the same degree to exactly double the distance of the first experiment.

*3rd Experiment.*—Three strands of wire were now employed in each conductor, twisted into a cord. The igniting distance was rather more than trebled.

My stock of wire was insufficient to carry this curious experiment further; but a trial with a weaker battery and shorter conductors as far as six strands in each, led to the inference, that the igniting distance increases in an arithmetical ratio with the *mass* of the conducting wire.

A very extraordinary circumstance presented itself in these experiments, one which has been previously observed by Davy, but the great importance of which in the present inquiry demands a distinct description.

If at the distance of 130 feet two inches of platinum wire become a bright red, we find that by shortening the wire to one inch the ignition is not increased, but diminishes remarkably. Shortened to *half an inch the wire ceases to be even sensibly warm to the touch!* This curious fact is one deserving all the ingenuity of the theorist to explain its nature, but my business now is with practical matters alone. It leads clearly to the employment of exploding wires of much greater length than we would employ were we ignorant of this very singular and apparently anomalous circumstance.

*Insulation of conductors not essential even in water*

The preceding observations refer to *dry* conductors. It is almost needless to say that dividing the wires in any part, and thus interrupting the circuit, at once causes the platinum to return to its natural degree of coldness.

It might be, and indeed generally is supposed, that were the conductors immersed in water, this fluid would carry off the electricity, and nullify all effect on the platinum. Thence it would be inferred that it would be necessary to insulate the wires, that is, to place them within a coating of some resinous, or other non-conducting substance, which would at the same time prove impervious to water and a barrier to the passage of the electric fluid.

Impressed with the idea that this insulation might be dispensed with, I instituted several experiments with the same battery and plati-

num wire already described, using the three-strand conductors led through water in the tank of the Medical College.

The result was, that the conductors being three inches apart from each other, and prevented from mutual contact by pieces of wood, as shewn in fig. 5, the platinum wire ignited gunpowder in a bottle under water, to a distance one-third the length of that at which explosion would occur were the conductors dry.

- This fact enabled me in the explosion of the barque "Equitable," hereinafter described, to dispense with the insulation of the conductors altogether, and to use naked three-strand wires, in the ladder-form, as represented in the plate.

It was manifest however that the water did interfere so much as to cut off two-thirds of the electricity in circulation from the standard battery employed. It was also found that approximating the wires towards each other to the distance of one and a half inch, produced a nearly proportionate diminution of the igniting distance. But separating the wires to the distance of three feet did not, on the other hand, materially lengthen the igniting distance. I did not attempt to trace the law by which this effect is regulated—neither time nor means were at my command to do so. But from one and a half inch to three feet constituted the limits within which, in a practical point of view, it was of the least interest to study the phenomenon.

#### *Floating conductors, construction of*

The preceding experiments made it manifest that to effect subaqueous explosions in fresh water with perfect certainty, *naked* wires, three inches apart, might be used to the distance or *depth* of 130 feet. It next became a point of interest to learn how far the distance might be extended by floating or insulating the portion of wires not necessarily immersed in water.

Several plans for floating the wires were tried; for example, earthen pots kept at a distance by slips of bamboo were used, but found very unmanageable, the breakage of one pot frequently throwing the whole line into confusion, and sinking so many of these frail vessels as to prevent any certain results being obtained.

I then tried corks, and with complete success. One of the conduc-



tors was led through the axis of each cork, and the cork slid along; as it reached its place a brush dipped in melted pitch was applied round the wire, and the cork shoved on the pitched part. In a few seconds the pitch set, and was protected by the cork. The entire of one conductor, 480 feet in length, was thus coated, and at an expense I may observe of fifteen rupees for all the corks required.\*

To the side of this corked wire the second conductor was lashed on by turns of cord. On placing the entire in the tank, I found, to my great satisfaction, that the conductors floated freely, were flexible, light, and manageable in every direction, and that with the battery all along employed, the standard platinum wire was ignited to the same distance as when the conductors were used on land.

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*Mode of insertion and protection of the platinum wire in the mine.*

These experiments left nothing to be desired so far as the battery and conductors were concerned. The next circumstance to be attended to, was the best manner of inserting the platinum wire into the charge of powder, so as to ensure explosion without risking the entrance of water, and with such arrangements as would protect the wires from sudden strains, which might endanger their being torn asunder.

Colonel Pasley, of Chatham, was reported to have led the terminations of the wires through corks, and then to have poured on a cement composed of suet, wax, and pitch. I speak vaguely, not being in full possession of the particulars of Colonel Pasley's method. His conductors were made of wire led through ropes, well insulated by pitch, and surrounded by tarred yarn. It is said that the heavy strain of these rope-conductors frequently tore the wires from the cement, destroyed the platinum loop, and prevented the desired explosion. I do not make this statement in full knowledge of the facts,—it is moreover my most anxious wish not to misrepresent this very distinguished officer; but my object in preparing for the explosion of the "Equitable" was to guard against the evils attributed to Colonel Pasley's system, by common report and newspaper statements.

\* Sola (the subaqueous spongy stems of *Æschynomen e. paludosa* of Roxburgh) was tried, but was found too brittle and weak.

My apparatus was thus prepared, see fig. 7—fifteen inches of the thick end of a gun-barrel *g*, *g*, were cut off, and a male screw turned on the barrel near its centre. To this screw was fitted a square plate of iron, half an inch thick by about five inches square *i*, *i*, having a hole at each angle to admit of fastening screws being inserted. A teak rod *t*, *t*, eighteen inches long, was now prepared so that it would just enter the gun-barrel when nearly red hot—two grooves were cut in the opposite sides of this rod, and the conducting wires let into the grooves and securely fastened in with a strip of wood and pitch cement. The rod and wires were then driven into the hot gun-barrel, and the whole immediately plunged in cold water. The contraction which ensued bound the rod and wires so firmly that no force could possibly affect the platinum loop, nor any leakage occur through the iron tube.

An inch and a half of platinum wire (*p*) was next soldered to the end of the conductors, and over these was tied a paper cartridge containing mealed Dartford powder—the cartridge was protected by a copper tube *G*, which screwed on to the end of the gun-barrel, and projected about three inches beyond the platinum loop. This tube was filled with Dartford powder and securely closed by a wooden stopper, cemented into its place by melted pitch.

The ignition of the platinum wire would explode the cartridge, and this the surrounding Dartford powder, which must burst the tube and explode the contents of the mine in which it was placed.

I may here advantageously anticipate the regular course of this narrative by stating, that the mine for the destruction of the “Equitable” consisted of a barrel-shaped wooden vessel, about seven feet long by three and a half feet in diameter, capable of containing 2,500lbs. of powder. The square iron plate *i*, *i*, fig. 7. *B*, was screwed into the side of this vessel, which was subsequently enclosed in thick sheet lead. Into the iron plate the priming tube, above described, was firmly screwed, a washer of lead being placed in the joint.


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Description of self-acting apparatus for igniting the wire at any given moment.

In compliance with the wishes of Captain Fitzgerald, the engineer officer in charge of the operations for destroying the wreck, it was determined to sacrifice the battery employed, by placing it immediately

over the mine—it therefore became necessary to contrive some self-acting apparatus by means of which the requisite contact of the conductors with the battery could be made at any desired period.

Bearing in mind that all that is required to prevent the ignition of the platinum wire is to cut, or otherwise interrupt, one of the conductors—or else to bring the wires into metallic contact with each other between the battery and the platinum loop—it will be easy to understand the action of the two pieces of apparatus which I now proceed to describe.

The first of these acts by restoring contact between the ends of a divided conductor, thus completing the electric circuit and igniting the wire. But as some unforeseen accident might interfere, and render it necessary to examine the whole arrangement after the mine was laid, a contrivance was added, which after an interval of four minutes would break the circuit again and render every thing safe during examination.

This apparatus is shewn at fig. 8. It consists of a watch from which the minute hand was removed, and its place supplied by a strip of copper four inches long and a quarter of an inch broad, and fixed by its centre to the arbor of the minute hand. Each end of this index carried by a thread a wire bent thus , the legs dipping into glass tubes fixed in wood, and containing a portion of mercury. As the copper index revolved, its advancing arm gradually lowered the bent wire *a a* into the tubes, and thus established contact with the battery, one of the conductors of which *c*, was interrupted at *d* and *e*. The opposite arm, also connected with a bent wire *b b*, would lift this from a similar pair of tubes after a lapse of four minutes, and thus break the contact should no explosion have occurred.

A glance at the figure in the plate will render the plan at once intelligible.

This apparatus could be set so as to go for any period from one to thirteen minutes. The watch employed cost twenty-five rupees.

The second self-acting contrivance was perhaps the simpler of the two, and depended on the fact, that if the conductors come into metallic contact with each other between the battery and the platinum wire, the electricity does not reach the latter, and no ignition occurs,—parting the conductors directs the electric fluid upon the platinum wire, and ignition accordingly ensues.

A joint of bamboo, see fig. 9 *b*, about 5 inches long by $1\frac{1}{2}$ in diameter, capable of holding 2lbs. of mercury, was fitted with a small brass stopcock below, through which when opened the mercury might escape. It was found by experiment, that when fully open 2lbs. escaped through the stopcock employed in a few seconds more than five minutes.

The bamboo joint was fixed on a wooden frame *ff*, having a vessel below to receive the mercury. A stout copper wire was led through the diameter of the bamboo, one and a half inch from the bottom. A similar wire was inserted three-fourths of an inch below, and in the same direction with the first, and this second wire was divided into two parts, as shewn in the drawing. The ends of the wires were turned into a few loose spirals to allow of their being readily connected with the battery on one side, and with the conductors to the mine on the other.

Suppose this joint filled with mercury, the stopcock shut, and the battery wires connected with it at one side (say the right,) and the mine conductors connected with it at the left—in this case metallic contact being established in the conductors *c, c*. between the battery and the mine, no ignition can possibly occur, because the electricity returns to the battery by the first cross road it meets, if I may be permitted to use this homely, but I think expressive, illustration.

If we now open the stopcock and allow the mercury to trickle out as soon as its level subsides below that of the highest copper wire, the only path of the electric fluid now lies through the mine, the platinum becomes ignited, and explosion ensues.

But should any accident have occurred, so that no explosion takes place at once, and should therefore the whole arrangement need inspection, the mercury still subsiding passes after two or three minutes below the second wire, which having been previously cut, the circuit is now completely interrupted, and the whole arrangement is perfectly safe for inspection.

In using this apparatus two things must be attentively borne in mind. No accident can happen while it is full of mercury, but when once emptied it must not be filled again while in connexion with the battery, otherwise an explosion may ensue.

The whole arrangement is shewn in the accompanying diagram, in

which *a* represents the battery, *b* the bamboo mercury cup nearly full of mercury, *c c* the battery conductors, *c̄ c̄* the conductors leading to the explosion tube *t*, containing the platinum wire and priming.

The whole cost of this apparatus, including quicksilver, is not more than six rupees.

It is obvious that many substitutes for the watch apparatus may be devised, and indeed the expense of even the cheapest watch procurable (ten rupees) is an objection, though an insignificant one, to its employment, where circumstances render it advisable to expend all the apparatus by placing it immediately over the mine. In a remarkable set of experiments which I witnessed, portfires were employed instead of the watch—one, six inches in length, supported by a string the wire for establishing the connexion with the battery, corresponding to the watch wires *a, a*—a second portfire, nine inches long, supported a weight, the descent of which was intended to break the connexion in the manner effected by the watch wires *b, b*. In two of the three trials in question the weight did not fall, and the consequence was the imminent danger of the destruction of the party whose duty it was to re-examine and re-adjust the arrangements on the failure of the two first attempts. In one of the trials it was observed too, that one of the tubes containing the mercury was completely choked up by melted saltpetre which had fallen from the portfire during its combustion. These defects seem to me to constitute a most serious objection to the use of portfires; I admit, however, that these are more of a military character than my contrivances—and in this, I believe, their chief merit lies.

Explosion of the barque "Equitable."

The barque "Equitable," bound to Sydney, and laden with wheat, rice, rum, &c. while proceeding down the river in September 1839, touched on Fultah Sand, and instantly turned over in six to seven fathoms water. The wreck lay on her beam-ends athwart Fultah Channel, the keel towards Calcutta. On sounding with the lead, the water over her quarter shoaled to three fathoms, and then suddenly deepened to five or six.

Capt. Fitzgerald, the engineer officer employed, determined to attempt the destruction of the vessel by the explosion of 2,500 lbs. of powder placed between the mizen and main masts, close to the deck.

The cylinder already described was admirably fitted up, under Captain Fitzgerald's directions, in the arsenal of Fort William; before being filled with powder, the exploding tube was screwed into its side, twenty-four barrels of powder were then poured in through an aperture left at the top of the cylinder, which was afterwards closed with wood and *soldered up* with sheet lead.

The cylinder thus prepared was slung on a cradle to the bows of the "Vulcan" anchor vessel, which proceeded down the river and took up her berth at Fultah, immediately over the wreck.

At the slack of the tide, on the 14th December, the preparations for lowering the cylinder being completed, the ends of the ladder-conductor were securely twisted to the wires projecting from the explosion-tube, a piece of wood interposed, and the whole guarded by a joint of bamboo and a wedge. As the cylinder was lowered, my assistant, Mr. Siddons, cautiously permitted the ladder conductors to follow, and when the cylinder was in its berth, the conductors were cut short, so as that their free ends should reach the bow of an old fishing boat, previously moored fore and aft over the wreck. To the bow of this boat the wires were secured by twisting them round screws inserted for the purpose; the length of conductors immersed in the water was thirty-four feet.

The battery and watch apparatus were placed on the boat—the watch set to twelve minutes—and, lastly, the battery wires twisted to the conductors at the bow. The party at the mine consisted of Capts. Fitzgerald and Debude, and Lieut. Smith of the Engineers, my assistant Mr. Siddons, and myself. When all was ready, one of the wires in the battery, purposely left out of its mercury cell to prevent accident, was placed in its position, and our party pulled away vigorously from the dangerous vicinity. At the thirteenth minute a slight concussion was felt in our boat, a sound like that of a very distant and heavy gun at sea was heard, and a huge hemispherical mass of discoloured water was thrown up to the height of about 30 feet. From the centre of this mass there then rose slowly and majestically a pillar of water, intermingled with foam and fragments of wreck, and preserving a cylindrical form till it reached an elevation of at least 150 feet. The column then subsided slowly, a wreath of foam and sparkling jets of water following its descent, and rendering the spectacle one of indescribable beauty.

On pulling to the spot we found the river absolutely thickened by the wreck and cargo of the vessel. By subsequent examination, it was found that with the exception of the fore-castle, the "Equitable" had by this explosion been literally torn to pieces. The fishing boat, battery, watch, &c. were all "expended."—The ladder conductors were however picked up uninjured half a mile from the wreck.

In conclusion of this paper—which circumstances induce me to publish sooner than I intended—I think it but just to express my thanks for the zealous assistance afforded me in all the preceding experiments, and in the construction of the apparatus, by Mr. Siddons, of the Medical College.

I should add, that while my experiments were proceeding, my colleague Mr. Egerton, suggested the placing of a strip of saltpetre match-paper round the platinum, in preference to placing this in contact with the powder. The excellence of the suggestion was proved by experiment, for we found on repeated trials that saltpetre match inflames at nearly double the distance at which the wire will explode powder.

The match should be prepared by immersing *cotton* in a saturated solution of the *purest* saltpetre; if the salt be impure the match is liable to become damp, and thus to frustrate the experiment. A few fibres of this cotton should be twisted loosely round the platinum wire.

It is astonishing to observe the great cooling effect produced on the platinum wire by the contact of *apparently* dry powder, if this be in the least degree damp. On one occasion with a new battery in perfect order, with dry conductors only 150 feet long, the standard platinum wire was kept for an hour in a pint bottle of powder just drawn from the canister, and no explosion ensued; but by removing some of the powder, so as to leave only a grain or two on the wire, the mass being half an inch below it in the neck of the bottle, explosion took place the instant the battery contact was effected.

I wish it to be remembered too that the preceding experiments are applicable only to explosions in *fresh* water; operations in salt water would require a special set of experiments, which I have not had the means of instituting on a sufficiently large scale. I have strong reason however to believe that the cork conductors with pitched wires will

succeed effectually in salt water also. Nay, even naked wires after having been used for about an hour as conductors in salt water are, I find, protected or insulated by the coat of oxychloride of copper, which forms on the positive wire.

In subsequent experiments I would recommend a copper or sheet-iron, water-tight, tube to be soldered round the internal orifice of the screw plate into which the explosion tube is inserted (see fig. 10 *c, c, c,*) This would constitute a separate compartment in the mine or cylinder, and in the event of leakage, that portion only of the powder could be spoiled contained within this tube. This alteration I have taken the liberty of recommending to Captain Fitzgerald and Lieut. Smith, the engineer officers employed in these operations.

Lastly, were I again to undertake the destruction of a wreck, I would employ cork conductors secured from the mine to a buoy, and from this I would float 100 yards of conductors to a boat containing the battery and the mercurial discharger. At such a distance I have little doubt but that the whole apparatus, battery, boat, &c. would escape unharmed.

Calcutta, 20th January, 1840.

ART. VIII.—*Proceedings of the Asiatic Society.*

(Wednesday Evening, the 1th December, 1839)

The Honorable Sir E. RYAN, President, in the chair.

The Proceedings of the last Meeting were read and confirmed.

Captain F. W. BIRCH, proposed at the last Meeting, was balloted for and duly elected a Member of the Society

His Excellency Sir JASPER NICOLS, Commander-in-Chief, was proposed by the President, seconded by Colonel D. MACLEOD.

Maharajah RAHAMU F ALI KHAN, Bahadur, was proposed by H. T. PRINSEP, Esq. seconded by the Secretary.

Read a letter from Sir G. C. HAUGHTON, acknowledging his election as an honorary Member

To the Secretary of the Asiatic Society.

14 Grafton Street, Bond Street, London, 18th July, 1839.

SIR,—I beg you will present my best respects to the Asiatic Society of Calcutta, and express to them how much I feel honored by the distinction they have conferred upon me in making me an honorary member of their Society. I am happy that any

little service rendered here on my part has been useful to a Society that has been equalled by few, and surpassed by no other, in the spirit and result of its labors. The names of JONES, COLEBROOKE, WILSON, and though last, certainly not the least, that of Mr JAMES PRINSEP, (whose melancholy state of health every lover of literature, science, and generous disinterestedness must deplore) will ever form a proud subject of remembrance to the Asiatic Society of Calcutta; and make the republic of letters join in the wish of its founder—*Esto perpetua*.

I need scarcely add, that my humble services will always be at the bidding of the Society

I have the honor to be, Sir,

Your very obedient humble servant,

GRAVES C. HAUGHTON.

Read a letter from the Dutch Government, returning thanks to the Society for the books presented on their behalf to Prince HENRY of Orange, during his visit to Calcutta.

A la Société Asiatique, Calcutta.

Le Soussigné, chargé d'affaires de sa Majesté le Roi des Pays-Bas, près la cour de la Grande Bretagne, a l'honneur d'envoyer ci joint à la Société Asiatique à Calcutta, une lettre du Ministre de l'Intérieur du Royaume des Pays-Bas par laquelle Son Excellence remercie au nom de sa Majesté Neerlandaise à la dite Société du cadeau qu'elle a fait, à l'occasion du séjour de Son Altesse Royale le Prince Henri des Pays-Bas à Calcutta, de plusieurs ouvrages scientifiques destinés à des institutions savantes du Royaume des Pays Bas

BARON BENTINCK

Londres le 19 Juillet, 1839.

Read the following letter from the Secretary to the Royal Geographical Society regarding the publication of Geographical Memoirs presented to the Asiatic Society of Bengal.

To the Secretary of the Bengal Asiatic Society, Calcutta

Royal Geographical Society, London, 1st August, 1839

SIR,—I have the honor to acquaint you, that in accordance with the suggestion of Major T. B. JERVIS, Surveyor-General of India, the Council of this Society has resolved to present a complete set of its Journal to the public Library of each of the ten principal stations in India, and I have now the pleasure to forward a copy, consisting of nine volumes, for the library of the Asiatic Society of Bengal, which I am to request you will be pleased to present in the name of the Geographical Society of London.

In making this communication, the Council beg to express their hope that this Journal may prove useful to officers who may be about to undertake journeys in the various parts of India, and in the adjacent countries, and to make known to them, that there exists in London a Society specially devoted to the advancement of Geography, which will gladly receive, and publish in the best form, the correct account of any journey in a country of which our Geographical information may be imperfect, as is the case throughout almost the whole continent of Asia.

I am desirous to propose to you the exchange, in future, of the Geographical Journal for the admirable Journal of the Asiatic Society of Bengal, which contains so much

valuable Geographical, as well as other information. Should this arrangement meet your views, the subsequent numbers of our Journal shall be dispatched to Calcutta as soon as published.

I am Sir,

Your obedient servant,

JOHN WASHINGTON, *Secretary.*

P.S.—The other nine stations are Bombay, Madras, Bangalore, Hyderabad, Mhow, Dum-Dum, Delhi, Meerut, and Cawnpore; which I mention in order that officers moving from one station to another, and desirous of consulting the London Geographical Journal, may know where to find it

Read a letter from H. T. PRINSEP, Esq Secretary to the Government of India, Political Department, forwarding a Topographical Report, and Meteorological Register of Tatta, by Dr WINCHESTER

Library

Read a letter from J. P. GRANT, Esq Officiating Secretary to the Government of India, Revenue Department, forwarding for presentation the following books on the part of Government —

Illustrations of Indian Botany, No. 9.

Dr. WIGHT's figures of Indian plants, Nos 9 and 10

The following books were presented —

Observations relative to the Statistical Reports on the sickness, mortality, and invaliding among the troops in the West Indies. By JAMES MOUNT, Esq. M. D
—by the author.

Proceedings of the Geological Society of London, No. 62,—by the Society

Transactions of the Medical and Physical Society of Bombay, Volume 2—by the Society.

Transactions of the Royal Society of Edinburgh, vol 14, part 1st,—by the Society

Proceedings of ditto, Nos 13, 14, and 15,—by ditto.

Third, fifth, and sixth Annual Reports of the Managers of the Pennsylvania Institution for the instruction of the Blind,—by the American Philosophical Society.

Pickering's Eulogy on Dr. BOWDITCH, President of the American Academy of Arts and Sciences,—by ditto.

Constitution, Charter, and Bye-laws and Documents relating to the Pennsylvania Institution for the instruction of the Blind—by ditto.

A Discourse occasioned by the death of JULIUS R. FRIEDLANDER,—by ditto.

Proceedings of the Committee of Commerce and Agriculture of the Royal Asiatic Society,—by the Society.

A copy of "*Akhlaqi Jelali*," translated from the Persian by W. F. THOMPSON, Esq. B. C. S —by the translator.

On the causes of Bronchocele in India and England—presented by Dr Malcolmson.

Hammer's Gemaldesal,—by the author.

Hammer's (4 vols.) Mahmud Schebisteris Rosenflor des Geheimnis Persich und Deutch, 3 copies—by the author

Jahrbucher der Literatur, vols. 81, 82, 83 and 84,—by the Editor.

The following books were received from the Oriental Translation Fund. —

Practical Philosophy of the Mohammedan People, being a translation of the *Akh-laki Jalaly*, by W. F. THOMPSON, Esq.

Kumara Sambhava Kalidasæ Carmen Sanscrit et Latine edited by A. F. STENYLER.

Rigveda Samhita Sanscrit et Latine by F. A. ROSEN

Lardner's Cabinet Cyclopædia; Statesmen, Vol. 7.

Museum.

A curious helmet used by the warriors of the coast of Mergui, with a spear and a couple of shields, were presented by a Member on the eve of his departure for Europe.

Antiquities, &c.

Read a note from Mr JAMES MIDDLETON, on the silver plate presented by Government on the 3rd July last, used for taking observations of altitude, and distance *Published in the present number.*

Read a letter from Counsellor VON HAMMER, forwarding his translation of the *Mohit*.

Physical

Read a letter from W. SCOTT, Esq. forwarding observations on the Tides at Singapore, for June, July, and August, and stating that in consequence of a Tide Gauge being established by Government, he will discontinue the observations for the Society in future.

Read a note from A. KEAN, Esq. on the Table furnished by Dr. STEWART, and published in the Journal for April last, respecting the Hindu population, and Mortality in each Police division and Thannah of Calcutta, for the year 1837.

Read a letter from Dr. J. G. SPILSBURY, forwarding drawings of Fossil Shells, with plates, by Captain P. A. REYNOLDS, 38th Madras N. I

Both the preceding papers have been published in the September number of the Journal

NOTICES.

The generous kindness of COLONEL MACLEOD, enables us to present our readers with the spirited and accurate sketch now published of the "Nizamut Palace at Moorshedabad." In binding the volume the sketch should be placed in juxtaposition with the architectural description given at page 552, of the July Number, 1839.

In our next Number will be published a sketch on stone of the explosion of the barque "Equitable," from the successful pencil of COLONEL LUARD. We regret that it is impossible to complete this admirable drawing in time for the present Number.

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 95.—NOVEMBER, 1839.

ART. I.—*Memoir on the Climate, Soil, Produce, and Husbandry of Afghanistan and the neighbouring Countries.*—By Lieut. IRWIN.¹

PART II.—OF SOIL.

90. It may appear an easy task to learn the nature of the soil in the various districts, or at least the more ostensible properties, such as colour and consistency, but in practice many disappointments will be experienced. Informants are apt to impose upon the inquirer their own petty experience, for the general truth of things; on few subjects is local vanity found so strong a vitiating testimony. Moreover, let the testimony be ever so candid; the circumstances of the case present some other difficulties. It is well known that within short distances the nature of the soil is often found to vary in all degrees. Evidence as to a small part of the district is here but little conclusive with respect to the whole, and it requires a large induction of particulars (which may not always be procurable) to establish an accurate generalization; and the terms used are often vague and of difficult interpretation. However strange, it is yet true, that the ideas of the Asiatics on colour are very different from ours, and their arrangement and nomenclature are calculated to mislead an inexperienced inquirer. From all these causes the following observations must be received, as they are offered, with distrust.

¹ Continued from p. 804

91. The immediate environs of Delhi are of a sandy soil, though not a mere sand, and generally of a yellow colour. In the northern road to Lodhiana, after a few stages the soil becomes more and more loamy and black. The soil of Paneeput is a fine sandy loam. At Umbala, which lies on the left of the Kughur, the soil is a deep loam or mud, of a dark brown colour and great strength. Kughur and Sursootee running in a muddy soil are narrow and deep, and hence a slight fall of rain makes them impassable. The Markunda, which the traveller crosses between Shadeepoor and Lundee, before he reaches the Sursootee, ultimately falls into that stream; it runs in sand, and is shallow and broad. At Sirhind and as far as Lodhiana the soil has a greater proportion of sand than on the banks of the Kughur. The soil of the country of Bhutner is various. The cultivated parts are loam or sandy loam; some of the pastures contain tracts of sand hills, and others of level hard clay. Under the great northern hills the soil has a great proportion of mud, of a rich quality and much natural moisture. In the road between Delhi and Lodhiana, water in wells is found at moderate depths, but to the left hand, in Hureeana and Bhutner, we come to places where the wells are of considerable depth.

92. In the Dooab or country lying between the Sutluj and Beah, we find the soil to possess considerable variety, but on the whole it may be described as a sandy loam of excellent quality, very little elevated above the surface of the rivers, and the wells are consequently shallow. The Beah runs in sand, and sweeps away in its waters sand of a yellow colour; the Sutluj in the rainy season is more turbid and muddy. The right bank of the Beah is high and sandy, and there seems to be a gradual descent thence to the Ravee. The soil of this part of the upper Punjab has a great proportion of sand, but yet has sufficient firmness. The remaining two Dooabs have a less proportion of sand, yet little loam is to be seen. In some places tracts occur which are naturally sterile. In the upper Punjab, the greatest cultivation, though perhaps not the greatest population, is in places near the great range of hills which bound it to the north-east, the soil there having less sand and being of superior quality. On the whole strangers have too high an opinion both of the natural advantages and of the population of this province. Its water is much boasted of, and that of the rivers may deserve praise, but that of the wells is seldom good.

93. In this respect it is much excelled by the Dooab of the Hydaspes and Indus, in which the water is peculiarly good. I must be understood as speaking of that in or near the Embassy's route from

Attock on the Indus, to Jūlalpoor on the Hydaspes; it has been already mentioned that some parts of the country to the left, or north-east of that route, are noted for Goitres, a disease occasioned by bad water, (see paragraph 89.) The soil in the greater part of this Doob but especially Pothwar, is a light yellow sand, which the rains cut into deep ravines in the most irregular and curious manner; every year the existing plain grounds are thus destroyed and new ones formed. Sometimes beneath the sand are seen strata of loose rounded stones, or of silt, stone, and sand, and these layers are sometimes of great thickness. Water in wells is near the surface, but the farmers are not at the expense of digging wells for irrigating their Rubbee crop, putting trust in the winter and spring rains, and the natural goodness of their land. Huzara and Pukhlee have good soils of various kinds, but yet inferior to Chhuchh; they have however greater command of water for irrigation. The soil of Kushmeer is generally loam, and in colour black or dark brown. The district of Pamper, in which alone saffron is produced, is a red clayey loam. The soil of Kushmeer and the nearest hills around it, is remarkably free from stones. The Hydaspes when low, is sea-green and turbid, its waters on reaching the Punjab are of a deep coffee colour. Its alluvial matter is loam, that of the Indus sand.

94. We return to Delhi to detail the nature of the soil in the Embassy's route thence to Peshawur. It becomes more and more sandy from Delhi to Rewaree and Kanour. The wells are of considerable depth, and the water often brackish. The country of the Shekhawuts, which next succeeds, is superior in all these respects, and the fields have occasionally a few stones in them derived from the low hills which traverse this tract. Leaving it we enter a sandy plain, generally abounding with sand hills. The depth of the wells increases at every stage till we reach Beekaneer, where it amounts to 264 feet. The water is sometimes good and sometimes brackish in various degrees. That of Nathoosur is peculiarly bad. Beyond Beekaneer the desert is commonly considered as beginning. To twelve miles beyond Poogul, or sixty-seven miles from Beekaneer, the same soil continues; but the sand hills are higher than before. Next commences a level hard smooth clay; this is locally called *Chitrang*, and it is only in such tracts that the traveller imagines he sees lakes and rivers before him. To the western edge of the desert is eighty-three miles more, and about half of this distance is clay, the other half sand, which appears to have been nearly blown over the clay. From Beekaneer the depth of the wells gradually decreases. The soil of the desert, generally considered, is not inferior

to that of Beekaneer, and where the sand and the clay are mixed in due proportions, is of an excellent quality. It is therefore neither the badness of the soil, nor the depth of the wells, as commonly imagined, that causes the desert to be so thinly peopled, neither is its water worse than that of the tracts to the eastward. There are several reasons to think it was in former times better inhabited. It is unquestionably for the interest of the British Government, that it should be utterly uninhabited and impassable; a little address and a moderate expense could effect this object even with a due regard to the rights of the present inhabitants.

95. The edge of the desert at Buhawulpoor is only three miles from the left bank of the Ghara, and the space between them from the north-west point of Sadik Khan's dominions to where the Ghara is lost in the Chunab (see paragraph 32) is seldom much more than double this distance. This narrow tract is of a soil not to be surpassed in fertility. When dry its surface has a degree of whitishness perhaps originating from a mixture of chalk; when watered it appears black. It is deep and friable, and may be called a clayey loam or mud. The Ghara when low has a whitish colour, and its water is very good. Its bed abounds in quicksands, having that mixture of fine sand and mud which seems calculated to form them. The rivers in general of the Punjab as well as the Indus have quicksands. Beyond the Ghara, on the road to Mooltan, is a tract of sandy ground, in which the wells are deeper and some of the plants and other appearances of the great desert occur, from which in fact it seems to have been cut off by the Ghara. It extends at most but two or three days to right and left of the road travelled by the Embassy; and gradually melts into the more fertile country which surrounds it. It seems to rest on clay, and the soil of Mooltan has a great proportion of clay; many of the fields give evidence of salt, and in general the soil is inferior to that of Buhawulpoor.

96. In the further progress of the Embassy from Mooltan to the commencement of the hills beyond the Indus at Punecala, the basis of the country appears still to have been clay, though in some cases the uppermost stratum be sand. At three and a half miles from the left bank of the Chunab begins the Thul of Mohummud Khan already mentioned (see paragraph 29;) it is sand of a poor quality, but not uncultivable. It is broadest to the north, and there too the wells are deepest. In this quarter is situated Munkeera, the chief fort of Mohummud Khan, which is thought to be secure less by the strength of its own works, than the barrenness of its neighbourhood, and the scarcity and badness of the water. In the route of the Embassy the wells were

of moderate depth, but the water sometimes brackish. Towards the Indus the quality of the soil and water improves, but the country is still sandy. Mukulwad, on the other hand, beyond the Indus, is a stiff and hard clay of an ashy colour; in process of time it may assume a different character. On the one hand the Indus is continually encroaching on it, and washing it away. Where that river has mixed its sand with the original clay, the quality of the soil is plainly improved. On the other hand, towards the Daman and the hills, are considerable tracts of sand incumbent on the clay, and impregnated with salt; the rains annually bring down more sand and spread it on the clay: The original soil on the right of the Indus, even as far as Shikarpoor appears to have been clay, and clay is even now predominant; but towards the river a portion of sand has been introduced from its waters; and towards the hills sand or stones, or both, have been washed down by the rains. South-west of Dera Ghazee Khan, which is the capital of upper Sindh (see paragraph 25) on the road to Seeweestan, are the sands of Dajul, which if extensive would constitute a desert. Largee, (see paragraph 14) is sandy and unproductive. The plain of Eesa Khel is a clay or clayey loam of the best quality; it is of a dark red colour; its breadth is inconsiderable, and the Indus is daily diminishing it. The same changes in short are here operating as in Mukulwad, for here also we find a tract of barren and saline sands under the hills. The water of the Koorm after rain is of a bright red colour, and it deposits a loam of good quality. The district of Bunnoo is sandy, or a sandy loam. In the country of the Murwuts, which lies to the right of that river, and south-east of Bunnoo, are some tracts of sands very similar to those already mentioned; such also occur between Bunnoo and the districts of Malgeen and Kohat. These districts however have as yet received but little injury, from their neighbourhood possessing an excellent soil, which may be called a clayey loam. The colour in Kohat is black or grey, but in Malgeen red.

97. The original soil, and that which still predominates in the plains of Peshawur and Bajour is a clayey loam; there are now however several exceptions deserving of notice. Opposite to Chhuchh is the plain of the Mundeers, or lower Yoosufzyes, the soil of which is of the same kind and quality with that of Chhuchh. On the other side of the Cabul river the Khutuks possess the south-eastern corner of the plain of Peshawur, which is light, often stony, and of indifferent quality; more to the west, but still under the hills, are Oormul and some other places in which the soil is sandy and naturally poor. The Mihmund's lands are generally a clayey loam; and the Khuleel's

have a still greater proportion of clay. The colour of the soil is various; it requires much water and much stirring, but when properly treated bears heavier crops than most lands in our provinces. Bajour is of a like nature. The lands of the Mihmudzyes and Daoodzyes have had introduced into them by alluvion a considerable proportion of sand. The latter are thirsty, and bear but ordinary crops. Swad and Punjkora has each its river, and are less clayey than Bajour. The Gugecanee lands are clayey, but such as are near the Ootman Khel and upper Mehmund hills have a mixture of stone. The Khuleels have the firmest soil, the clay extending to a great depth, and water being at a considerable distance from the surface: hence this tribe have dug many underground dwellings, in which to take refuge during the heat of midsummer, and they are not subject to fall in like those made in other parts of the plain.

98. Teera has a stony soil, which generally contains a considerable proportion of sand. Koonur and Lughman are loams of good quality, and very well watered, and productive in rice. The former because of its wideness requires a greater quantity of water for irrigation than Bajour. Jellalabad is a sandy and thirsty soil. Under its hills (the range of 34°) there extends on the left hand of the traveller to Cabul a barren tract, in length about forty-five miles from Busawul to Nimla; and in average breadth about five or six. It is partly stony and partly sandy. Perpetual winds here prevailing, it is thought that these sands are encroaching on the good lands. The present soil of Jellalabad has probably been transported from them by the winds. The lands of the upper Mihmunds are of very various kinds. Kama is clayey and moist, Goshta is inclined to sandy.

99. We find considerable variety in the soil of Cabul. The greater part is a loam with a great proportion of clay, but stones, gravel, and sand, have been lodged under the hills by the rains. On the left hand of the traveller as he goes to Ghorbund from Cabul, is a sandy tract under the hills. It is about eleven miles long by four broad, and quite uncultivated. This is the Reg-ruwan of which many fabulous stories are told by Aboolfuzl and others. The gardens and grounds used for raising vegetables in the vicinity of Cabul, have, by long care and culture been cleared of stones, and now have a black, fertile vegetable soil, from nine to twelve inches deep. In general the lands in this valley bear heavier crops of all things proper for the climate than those of the plain of Peshawur; but this is partly attributable to the plentiful manure and assiduous culture they receive. Draw-wells are but little used, as water is near to the surface; but the water of draw-

wells in the city of Cabul is acknowledged to be bad. The neighbourhood of Ghuznee has a light soil, with a mixture of small stones. Some other parts of the table land are stiffer, as having more clay in their composition. A mixture of stones in the cultivated fields is universal, and indeed considerable tracts of the table land are so covered with small stones, as to yield but little, even in pasturage. The north has a good deal of broken ground; the south is more level. With respect to the lands of the Huzaras, they are of no one kind except that they are generally stony.

100. Mookr and Abitazee, on the road from Ghuznee to Candahar, have light soils with a mixture of small stones. The Dooranee country generally considered must be pronounced sandy. Near Candahar the soil is sandy and thirsty, but facilities exist for irrigation. In the city of Candahar water in draw-wells is near the surface, and of good quality, and few places can be named in the whole of Khorasan where the water is bad. In general the inhabitants drink from running streams, but draw-wells are not unknown, especially within cities and in the desert places frequented only by shepherds. Between Hirat and the Persian Khorasan there is a sterile tract, which forms an imperfect barrier. The Regimulikan would be crossed in the direct road from Jellalabad, the capital of Seestan, to Furah, and is of considerable extent. South of Soorbut the traveller crosses a desert tract forty miles broad, on the road to Goonabad and Ghaeen. In Seestan, especially the west, there are considerable expanses of sand, generally without fixed inhabitants, and sometimes without water. Between Jellalabad and Kilat of the Beeloches, the country is supposed to be generally a desert. The various desert or sterile spaces now mentioned, appear to me to have an imperfect communication with one another, and therefore do not constitute a military barrier; nay, we perhaps over-rate the difficulties they would throw in the way of the disposition and passage of troops. By digging draw-wells an enterprising and ingenious enemy would find water at a less depth in the earth than is commonly imagined.

101. Zumindawur is situated, as already mentioned, on the right of the Helbund, (see paragraph 56.) Its soil is more loamy than that of most other parts of the Dooranee country, and is of a good quality. North-west of it is the country called Seahbund, situated within the Paraparnisan mountains, and inhabited by the Tymunus, a tribe of Ymaks: part of it has a clayey soil. The Gurmseer lies south and south-west of Zumindawur. Its soil, which is naturally sandy and weak, is rendered productive by water drawn from the Helbund. The Joolgha

or plain of Hirat is a sandy loam naturally fertile, and being well watered bears good crops. The same species of soil extends to Murv, and beyond it, although the intermediate space be little cultivated. The soil of Murv is esteemed very good ; that of the Jumsheedee tribe, whose territory forms the north-east corner of Khoorasan (see para. 19, 27,) is perhaps equally good, and the Ymak vallies are in general fertile. In the Jumsheedee country, and also in Jam and Toorbut, is a great deal of broken ground. There is a less proportion of this in the country of Ghaeen, and Birjund, and in Zumindawur, but still it is considerable. Ekatool, belonging to the Ulukhoo-Zyes, a tribe of Dooranees, is remarkable for the quantity of its ravines and broken ground. Sungoo a city of Khaf has a hard clayey soil. The soil of Mushhud is good and productive. To the north we soon reach the desert of Margiana, which is generally a sandy plain, but contains some low hills or hillocks. To the east it approaches near to Muno, and north of that place joins the sands lying between Bactria and the Oxus (see paragraph 104.)

102. The great desert called Loot, lies south and west of Seestan, and divides Seestan and Khoorasan from the Persian province of Kirman. It undoubtedly communicates with deserts in the west of Bulochistan, or those deserts form a part of it. It is throughout a sand, probably quite uncultivable, and the edges only are visited by the pasturing tribes. It is crossed by caravans, and sometimes by small parties of marauding horse, but in these quarters those who go on expeditions, generally mount themselves on camels, as being more patient of thirst. Like other deserts its outlines are not easily traced, as it gradually melts into the inhabited country. In the road to Tubus (the westernmost of that name) in Khoorasan, the last inhabited place in the province of Kirman is Durbund, which is forty *fursukhs* from the city of Kirman—at Durbund are some brackish springs ; thence are forty-five *fursukhs* of desert, to Chihlpaya, where are no inhabitants, but a tank containing rain water, and a bowree dug by the order of Nadir Shah. It is reckoned to be 300 feet deep, and the water is brackish. There is here a hill which appears as if overturned by some convulsion of nature ; it has not the least vegetation, and there is little grass or even shrub in this dismal desert. After fifteen *fursukhs* more, we reach Naeebund, where is some good water from springs in hills, and a few resident inhabitants. The country is still sandy and continues so far, several stages towards Tubus, and the population is but small. There is a road east of this road from Nil (see para. 27) to Khubees, where the chief inhabitants are Ghiljees, who settled

there during the time that the Afghan dynasty ruled Persia. This is even a less practicable road than the other, and in summer is not travelled. There are eight stages of a camel journeying almost incessantly, and no water is to be had in the whole space. This desert then may be pronounced impassable by regular troops, except in the smallest bodies.

103. Our knowledge is very scanty concerning Bulochistan. Its western parts or western boundaries are generally desert, but in some places villages are interspersed. There is a winding road from Kilat to Kirman through Punjgoor, Jalk, Dezuk, and Bempoor, but various parts of the stages are desolate; the soil even in the route I conceive to be generally sandy; the fertile spots are at the foot of hills, which yield them either by nature or by means of art, a scanty supply of water. The hilly tract on which is situated Kilat is much superior to the preceding, yet even here are several upland wastes in which even water is not to be had for one or two days' journey. The soil of Kilat seems to be generally loamy, but in some places is a stiff clay. Such feeble streams as the Buloch hills yield being soon absorbed in this warm climate, there intervenes a dry space between the hills and the sea-coast, which may be compared to the Tehama of Hejaz and Yemen. In this space Rind tribes wander, whose chief riches are their camels. The soil seems to be most commonly inclined to clay. In Seweestan, a clay or clayey loam seems to predominate, but Dajul (which perhaps belongs to Sindh) is sandy, and there are other exceptions. In Seeweestan water in draw-wells is deeper under the surface than in Sindh, but yet at no inconvenient distance. In some routes spaces occur, of perhaps forty miles broad, where neither water nor cultivation is to be seen, but there is little reason to think the circumstance owing to the badness of the soil; some were formerly well peopled. There is a tradition that the river Indus taking a bold turn to the right formerly ran through this country, and appearances are said to favor it. The lake or swamp called Manchoor, mentioned by Aboolfuzl, was perhaps a part of the bed of the Indus; it is thought to be in the south-east. Aboolfuzl tells us it is near Seewee, but this I conceive erroneous. There are some low and moist lands in Seeweestan, which perhaps were also parts of the Indus bed. There is reason to think that from other causes the rest of Bulochistan (and the remark might be extended to other countries) is drier and more barren than in former times.

104. The soil of Bactria from Mymuna to Talikan, has a great proportion of clay in its original composition; at present this is most

visible in those parts which are neither near to the hills nor the Oxus ; for towards the former, the matter brought down by the rains has often changed the soil to stony, gritty, or gravelly, sometimes to sandy ; towards the Oxus the soil becomes a loose unfertile sand. The sands begin at Huzrut Iman, and continue to the lake of Aral, their breadth continually increasing. In the space intercepted between Huzrut Iman and the common road from Bulkh to Bokhara, through Kilif, the average breadth of these sands, which are nearly waste, is more than thirty miles ; the sandy tract opposite, on the right of the river, is not so broad. The soil of Bulk is a clayey loam, sufficiently friable, and of a good quality. That of Koonduz is very similar, and in colour black. Khoollum, and generally that under the hills is a hard gravelly clay. Talikan is a loam inclining to clay, of a good quality. Undkho has a good deal of sand, but Mymuna is a strong clay, and abounds in ravines and broken ground. About half way between Undkho and Mymuna the traveller begins to see numerous hillocks in the plain, and they continue as far as Muro, and almost to Hirat. They are composed of a good soil, without stone, and bear good grass ; they are sometimes under crop, but the chief cultivation in this space is near the moist banks of streams constant or temporary. Budukhshan has a stony soil, but otherwise it is very various in consistency, colour, and excellence. Fyzabad is a sandy loam of a reddish colour, as is found in many other places. Durwaz, and the Shooghnan and Wukhan vallies have a blackish soil. The same observations are probably as applicable to Wukeeha and Keerategin as to Budukhshan.

105. The west of Toorkistan is sandy, and without artificial watering yields poor crops ; hence the chief cultivation is near the banks of rivers and streams. Between Kilat and Bokhara the water of wells is usually brackish, but is found at moderate depths. The hillocks near this road are of sand, not of a good soil as those of Bactria. To the west of Bokhara is the Kurakol, an uncultivated space which extends to the lake of Aral ; but it is not considered as crossing to the left of the Oxus, where begins the great desert of Margiana, so called by the ancients. The principality of Khwaruzm is thus encircled by deserts. It is however to be remarked, that the Toorkmuns who live on the edge of the river, generally avail themselves of the facilities it affords for irrigation in its flood season, and raise some crops on the low grounds near it. Water is here so near the surface, that the inhabitants often dig wells, where they pitch their tents, to serve for their use during the time they may halt. In the interior of the deserts there are wells, which have

been dug by the governments of former times ; these are never remarkably deep in the Kurakol, but the water is at least as good as that of draw-wells in the neighbourhood of Bokhara. The soil too is seldom impregnated with salt, and were it the custom of the country to water lands from wells, it could be brought into cultivation. At present it affords an early grass to be pastured in the spring. That part which is next to Bokhara, was formerly cultivated. The Kurakol extends beyond the Jaxartes into the country of the Kuzzaks, but that people have also hills and declivities with a good soil. With respect to the Kirghiz country, and the east of Toorkistan, the soil has considerable variety ; many places are stony ; loam and clay are very common, and in natural fertility the cultivated lands of the east are unquestionably superior to those of the west. The Pamer has a rich soil.

106. In the vast extent of Chinese Toorkistan it may be supposed there is to be found all varieties of soil. That of Yarkund is sandy and weak, and sandy wastes intervene between it and Khootun, in which the Chinese Government have erected pillars to guide the travellers into the right road. The uncultivated space is about an hundred miles broad, if we pursue the ordinary road. The soil of Khootun is superior to that of Yarkund, and the cultivation considerable. The river of Yarkund passes through this country. To the north-east sands soon recommence, in which the river is at length lost, at no great distance from Toorfan. Ela and Aksoo lie near to mountains in northerly directions, are tolerably well watered, and the soil is good. Akeoo seems to be north and a little east from Yarkund, and the road is sometimes inhabited, sometimes not.

107. There remain some countries of which we have little information which can throw light on the present subject. Such are the Tibets and Kushkar. We know that they are ill cultivated, and perhaps the climate condemns great part of them to sterility. Other parts may be occupied by rocks and stones. From the particulars now detailed, it is evident that the countries most favoured by nature, are neither the upland tracts nor yet the open plains distant from hills, but those which lie at a moderate distance from their foot, and receive the water which flows from them. Lofty mountains however barren themselves, are the cause of fertility to the plains below. In the vast expanse here treated of, there is a very great proportion now uncultivated, and may continue so for ever. Some part is a loose sand or hard clay, unproductive without much water, which at the same time the climate and situation deny ; another is covered with a profusion of stones. - The composition of some lands seems adverse to the growth

of useful vegetables. The commonest species of this kind is saline land, which occurs at intervals in almost all the various districts which have been mentioned. A mere sand and a very hard clay seldom give evidence of this quality, which is thus found in soils otherwise of the best composition. Chhuchh, the lands of the Mundurs, and those of the Huzaras, are remarkably free from it. A certain degree of it is by no means inconsistent with fertility, nay, the natives of the west of Khoorasan, prefer land moderately saline for the raising of melons and cucumbers: some remarkable saline spots are mentioned under the subject, which next follows, (see paragraph 112.)

PART III.—OF NATURAL HISTORY.

SECTION I.—Of Minerals.

108. The Persian metals are not found in these countries in great abundance. Most of the streams which rise in the great northern range, or in that branch of it which forms Kafiristan, and also those streams which arise in the Belur, wash down grains of gold which the natives take pains in collecting, but it is not supposed that this business is very profitable. In some parts of the south-east of the Huzara country, grains of gold are also found. With respect to silver, if we except a little found in the country of the Kafirs, it is produced no where but in the Chinese dominions, and I am not sure whether it be in their ancient territories or their new acquisition of Chinese Toorkistan. Copper seems to have been formerly found in the district called Seahbund (see paragraph 101) and according to some it is produced not far from Nishaboor, which is in the Persian Khoorasan. The same hill which yields it, is said to yield iron and lead; but according to others, lead is the only metal produced. Between Furah and Ghaeen, is Tubus, called *Miseen* from its copper mines, and to distinguish it from another Tubus, far to the west, commonly called Gil Tubus. At present both are under the Persians. Indications of copper are to be seen in the Bajour territory. In the kingdom of Bokhara, is a town called Sherabad, about seven days south-east of Bokhara, and about two days north of Sherabad is a hill called after it which produces copper, not wrought, and also verdigris, which is an oxyde of copper. With respect to precious stones, the ruby mines of Budukhsan, once so famous in the whole world are no longer wrought. We are told that in the south-eastern parts of that country

are whole rocks of *lapis lazuli*. Nishaboor is still famous for its turquoises, which are found in a hill in its neighbourhood, that yields no other mineral product. Major Welford has mentioned *lapis lazuli*, hyacinths, crystal, bajor, stones of a superior quality, and marbles of various colours, being found not far from the banks of the Indus, before its junction with the Cabul river, (see his paper on mount Caucasus in the sixth volume of the Asiatic Researches) I scarcely remember to have heard of these things, but as that author's information is generally very correct on points of geography and statistics, I presume there is much truth in the account.

109. Aboolfuzl has mentioned an iron mine at Khiroo in Kushmeer, and it is still wrought, being perhaps the only mineral of any note to be found in the valley. There are numerous mines of iron near Kanee Goorm of the Wuzeerees, which lies to the north of the range of $32\frac{1}{2}^{\circ}$, towards its termination to the eastward. Iron is found near Burawul, and Burwa of the Turkoolnees, and also above Deer of the Yoosufzyes, lying in Punjkora. In all it is gathered in the state of coarse sand or gravel. An iron mine was formerly wrought near Dhukha of the upper Mihmunds. Near Cimnan, a city of Khoorasan, on the frontiers of Irak, iron is produced, and also in a hill four days south of Ghaeen. The existence of iron in the territory of Nishaboor is disputed; an ore of this metal is found in a hill of Chhuchhh or Huzara, six miles west of Hussun Abdal. In Toorkistan there are very numerous mines of iron. In the territory of Kokum may be two, in that of Bokhara one, in that of Hisar two. Shuhursubz has one mine, the territory of Tashkund one, perhaps more. It is said Keerategin and Durwaz have none. In the territory of Fyzabad there are four mines; and in the small principality of Kolab, the greater part of which lies on this side the Oxus, between Keerategin and Fyzabad, there is one. Bulkh has one mine in its hill to the south, and Tolekan another. Notwithstanding the number of iron mines in Toorkistan, that metal is imported from Russia, and is of a superior quality.

110. Lead is very abundant in many parts of these countries. Not unfrequently it is found in the same matrix with soorma, which is an ore of antimony;* sometimes it is found alone, as soorma also is. I have heard of the following mines of joint lead and soorma, viz. two in the country of the Afreedus, one at Khakshista of the Huzaras, south of Bameean, one or two near the source of the Urghundal, two

* I am now (January 1811) assured there is also sold under the name of soorma a certain sulphate of lead, and it is natural to suppose, this is the substance here meant.

at least in Chitral, and one in the dominions of Kokur. One mine of lead is found in upper Bungush. In the country of the Shinwarees, who are west of the Afreedus, one mine. There are two mines in the country of the Kokurs, and one at Turbulakh of the Dehzungee Huzaras, who are the most westerly of all. Near Baghis of the Tymunees within the Ymak hills, the spring torrents bring down pieces of this metal. I have not heard of its being found in any other place of Khoorasan, except near Nishaboar. In Toorkistan it is very abundant. There is one mine in the hills near Bulkh; in the principality of Talikan there seem to be two mines. In the district of Undurab there is one mine, and in that of Khoost another. Lead is also found in Khirjan, which lies between Khoollum and Bameean. In Budukhshan lead is abundant, and there are three or four mines in the valley of Wunj. Some lead is also brought through this country from Kashkar and the borders of the Kafirs. Kolab has two mines, Buljeewan, which is under the lesser Kolab and is beyond the Oxus, has one, and in the territory of Hisar are two. Nooruta has one mine, and there is perhaps another in the dominions of Kokun, and one or two in those of Tashkund. There is one mine in Keerategin, probably more. Soorma without lead is found in the principality of Talikan, in several places, and is said to be abundant in Budukhshan, Durwaz, and Keerategin. Soorma is found in the country of the Besoot Huzaras, who are among the most easterly of that nation. A mineral called white soorma, is found near Dubran, which lies north of Huzara.

111. Orpiment, which is yellow oxyde of arsenic, is found near Sakhir in Seahbund, and in more than one place in the hills of Bulkh. It is also produced somewhere in Budukhshan, near Lungreeal, which is not far from Dubran; it is the ore of some metal of a whitish colour and a consistence which adapts it to be easily made into bullets. Towards Cabul and in many other places, the villagers use a certain species of gravel, called *sungisachma*, for shot. The most famous place for sulphur is Gogirduk, between Khoollum and Bulkh, but this mineral is said to be found in some other places of Bactria, to the east of Bulkh. Some is produced in the territory of the greater Kolab, and some in that of Fyzabad. Sulphur is reported to be found in the hill of Sherabad (see paragraph 188.) It abounds in Chitral, and some other parts of Kashkar, and some of it is in an oxydized state. Some is to be seen in the desert of Margiana (see paragraph 101.) There are two mines in Seeweestan, of which one is near Bhag, and one not far from Sunnee. The western Tubus is famous for its sulphur, as well as its tobacco. Some of the springs of the Kafirs

smell of sulphur. In these countries are many warm or even hot springs which could be named. The other natural curiosities known to the natives do not deserve much mention, especially as the circumstances of some seem fabulous.

112. The supply of common salt is from various sources ; rock salt, that of salt ponds, that of springs, and that made from the soil. A minor range of hills has been already distinguished as the Salt range, (see paragraph 12.) Some is found at the beginning of the range in the country of the Oorukzyes, but is of little note beyond the neighbourhood. At Kala Bagh, the hill which overhangs the town, is in a great part composed of salt. Near the termination of the range, this mineral again becomes very abundant, and is found in several places. This is that which in our provinces is called *Lahouree*, as coming to us through Lahour, though all produced beyond the Hydaspes. It is of a dingy colour, whereas that of Kala Bagh, which is superior, is either so white as to be pellucid, or tinged with a red colour from the clay contiguous to it. The north is supplied from these mines, whose produce is carried even into Kashkar, where it fetches a high price, because of the natural difficulties of transporting it. It is rather heavily taxed, in Kushmeer which makes it dear. When the governor rebels, which has often happened, and trade is checked by the existence of hostilities, the dearth is still greater, in so much, that the Kushmeerees having no interval supply, have been reduced to eat red ants as a substitute. In the south of the kingdom, the demand for rock salt is not great. Some is indeed carried from Kala Bagh, as far as the lowest parts of Sindh, but this traffic bears no proportion to the riches and population of that country, and indeed seems an appendage to that in the transporting of pilgrims, who intend visiting the holy city of Mecca. The boats are sold on their arrival with what cargo they may contain, and few if any again ascend the river as far as Kala Bagh. In all parts of Bulochistan, soil salt is that chiefly used, and each neighbourhood makes it for itself. Even the Moolta-nees consume more of this kind, pretending that the other is unwholesome. Candahar is partly supplied with salt from that made by boiling the water of a spring at Kushkinukhood, 40 miles on the road to Hirat, and partly from the soil ; the latter is reckoned inferior. The chief resource of the west or rather middle parts of Khoorasan, is probably in salt ponds, in two different places of the country of Ghaeen. An ice-like crust is formed at the edges, when the water begins to recede in the dry season, and no further preparation is required. Besides the salt well in the Loot desert already mentioned, there is one about

40 miles south of Toorbut, and another in the road between Toon and Yezd, but none of these are of any use. Near Ubasabad, which is ten days from Mushhud, on the road to Tuhiran, is a hill which gives out two feeble salt springs, which make two bogs, and to procure salt pits are dug at the edges and filled with the brine; this gradually evaporates, and is covered with a saline crust.

It is probable, many lesser ponds and bogs of this nature exist especially in the level countries. Bokhara and Nooruta chiefly consume salt brought from places in the Kurakol (see paragraph 105.) Jizzukh has a mine of rock salt, and also salt from the plain. Samarkand is said to have one mine, Oratepa another. All the three are under Bokhara. Oorgung, Mura, and Mymuna chiefly use salt found in their own plains, sometimes artificially prepared, sometimes not. The kingdom of Kokur is not destitute of soil salt, but has besides at least four mines of rock salt. Tashkund has one, probably more, and also receives salt from the plains to the west towards the Kuzzaks. We know of two mines in Keerategin, one in Buljeewan, two in the greater Kolab, and the valley of Wakhan has rock salt, but the southern part of Budukhshan in which is situated Fyzabad, seems to have but one mine, and its produce is very bad. The eastern part of Bactria, on the other hand, is abundantly supplied, having at least five mines, and Duroona beyond the Oxus has one. One mine of Shuhisubz yields salt of a very fine quality, which is carried as far as Bulkh and Bokhara for the use of the rich. Hisar has a salt spring, and two mines very little worked exist in its dominion. Bulkh and Bokhara are partly supplied from springs found between them, partly from a place under the hills, where a crust of salt is produced. Shibirghan has a mine of very good quality, and exports to Bulkh, Undkho, and other places. I have not learnt that any salt is found within the Paraparnisan mountains, and such is the scarcity of this article among the Huzaras of the interior, that they do not use it dry but dip their morsels in a brine of it. At one time of the year the poor have none to consume.

113. Saltpetre is no where found in these countries but is made by natives, from the soil in innumerable places. It is a curious fact that the same earth which yields common salt often yields saltpetre also, although both ingredients be different; but dry situations are more favorable to it, and moist to the generation of salt. To complete the list of ingredients used for making gunpowder, it may be observed that no place is much famed for its charcoal. The best is made from the willow, and very good from the plant called uk or mudar (see paragraph 130.)

Borax is dug up near Mushhud in an impure state. A salt called black salt is found in a hill some miles south-west of Kala Bagh. The most famous product of Kala Bagh is its alum, which however is not native, but is prepared from a mixture of pure clay and sulphur, found in the same hill which yields salt. The same exists in small quantities in the quarter where the Lahouree salt is produced.

114. I have made no mention of the minerals of the Tibets, or country north of the Punjab, or those of the Rajpoot country. We know little of the minerals of Chinese Toorkistan, except that coal is burnt at Ela, in that country; and some mistakes have probably been committed in assigning the situations of mines in independent Toorkistan. With respect to the structure and general composition of the hills and mountains, it is needless offering conjectures; the hills seen by us were plainly secondary. Soft and composite rocks appear to be very common in Afghanistan, and hence it is that in a country so mountainous, few houses are built of hewn stone. The valley of Kushmeer is peculiarly destitute of stones proper for building; wood at the same time is cheap and abundant, and therefore the inhabitants erect lofty houses of that material. Good flints are found in many places in the south-east of Bactria, (from whence they are brought to Cabul) in some low hills in the districts of Muro, in those west of Sindh, and doubtless many more. Upper Bungush produces a marble much esteemed.

SECTION II.—*Of Vegetables.*

115. The present is a subject on which little is known. What here follows being also very imperfect, it is needless to affect nice divisions, and it is enough if we distinguish plants into three classes; first, grasses and small succulent plants;—second, shrubs;—third, trees.

1st. Of Grasses, &c.

116. It is moisture which chiefly encourages the growth of herbage. Those countries however are not the most verdant in which the greatest quantity of water falls in the year, but those in which there are many days of rain, dew, and mist. The water which falls in low latitudes, does so generally in a short space of time, and with great violence, so that drought prevails during the greater part of the year; hence warm countries are seldom verdant. We should be in error if we supposed that heat, as distinguished from drought, was

hostile to verdure. The season of grass in all countries begins with the renewal of the warm season, unless in circumstances the most peculiar; and even in warm countries the herbage withers at the beginning of winter. Neither are we to decide that warm countries have naturally more grass throughout the year than the cold; for if their summer be dry, the heat of the sun soon withers the pastures, which do not recover until next spring. It is evident therefore that the growth of herbage will be greatest where heat and moisture meet in due proportions. Moisture may arise from the atmosphere or from the soil; and with respect to the moisture of soils, it may arise either from the composition or a low position. It is thus that a clayey loam is better covered with grass than a loose sand or a hard clay; and many districts, the drought of whose climate would leave them little verdure, have abundant grass which is nourished by the water descending from higher situations. A new complexity is added to the subject when the periodical rains fall in the summer, and thus revive the grass which has been withered by the heat in the warm climates.

117. It is found that in India every grass and small plant has its natural seasons of putting forth its new leaves, flowering, casting its seed, and withering. Most of them flourish most in the Kureef, that is after the great rains have begun to fall. Very many however even of these put out new leaves in February and March—soon to be burnt up by the scorching winds; and some of them bear seeds in the Rubbee as well as the Khureef. Some plants naturally flourish in the Rubbee; for example, the Sehoon, or wild oat—the seeds of which are shed before the commencement of the great rains, but do not spring up until perhaps the month of October. From what has been said, it is plain that in India there are two seasons of grass—the lesser in spring, and the greater in the great rains, and for a short time after them. The winter months have but little fresh grass, but there is a considerable resource in the withered grass of the Khureef. Between the spring and Khureef grass is an interval in which the pastures are burnt up by the excessive heat and drought; if the soil be very moist, or frequent showers fall, this interval may not be perceptible. It may be supposed to be the same with every country which, like Hindoostan, has a warm climate, and its chief rains in the summer; but when either fails we no longer find these two natural seasons of herbage. When the cold reaches a certain point, the heat of summer is not sufficient to wither the grass after its commencement in the spring, and this is reserved for the cold of winter. The grains of the Rubbee, also, it may be observed, in climates where the winter reaches a certain degree of

length and severity, do not spring up in autumn, but in spring, and ripen in autumn. In warm countries which have no summer rains, the spring grass having once withered, does not recover during the remainder of the year.

118. In the Punjab and Sindh the seasons of grass are the same as in our provinces, and the species are much the same. In the upper Punjab there is perhaps more grass fit for provender than in our upper provinces, but the large kinds used for thatching are scarcer, this however is of little consequence, the inhabitants preferring flat-roofed houses covered with mud, to the thatch so common elsewhere. Hurriana and Bhutner are well known to have abundance of good grass; and the country in general which lies between the Sutluj and the Jumna is more verdant than that on this side of the latter river. The Dooab of the Hydaspes and Indus present the usual varieties. Pothwar has but little grass, except in the bottoms of the ravines. The hilly country of the Gukhurs, and others already mentioned to the north, appear to have much grass, but this does not arise from the great growth but from the small consumption. In the Thul of Mohummud Khan, as in the great desert, we find more shrubs than grass. Mooltan, and upper and middle Sindh, have little grass. The spring of Peshawar is naturally later than in our provinces, and the rains which then fall have an additional tendency to protract the time of fresh grass. The lateness of the summer rains, and their comparative unimportance, makes the Khureef grass later in commencement, and causes it to be little superior to that of the spring grass in this country; it is even said that in Jellalabad the spring grass is of more importance than the Khureef. In Seeweestan though the summer rains are scanty, the Khureef grass is superior to the other kinds; but herbage is not abundant in that province. Peshawar, though its summer rains are deficient, has yet as much grass on an average of all months as our provinces, for showers fall at different times of the year, and the soil is good. The name of Shurhsudz which Tymoor gave it, we may suppose alluded rather to its constant succession of green crops, than the exuberance of its natural vegetation in grass, which is not extraordinary. The least quantity of grass is in the middle of winter and the middle of summer.

119. The seasons of grass in Chhuchh, Huzar, Kohat, Malgeen, Eesakhel, and Bunnoo, are nearly the same as in Peshawar, and the quantity not very different. Mukulwud has but little grass, but some parts of the Daman have a great quantity. The hills called Bedaulut, owe their name to the scantiness of their herbage. The hills of Bajour,

Punjhora, Swad, Bhooner, and Pukhlee, afford abundance of grass in the summer; and the plain of Bajour is even more verdant than that of Peshawar. The grass of Koonur is inferior to that of Bajour, and that of Jellalabad to Koonur, but Lughman is superior to both. Kushmeer, and the hills which surround it, have a very abundant herbage in summer, but it is not reckoned nutritious; in the winter the sheep and other stock are house-fed—a management probably more judicious than if they were kept on the grass remaining under the snow, or were driven to a warmer climate.

120. A great part of the surface of the districts of Cabul and Ghuznee is covered with stones, and the soil is in other respects unfavorable to the growth of grass. The new leaf appears in April, and there are but few places, where it is affected by the summer heat, or withers until autumn. If the soil be moist and has been well covered by snow, the grass remains green even during the winter, but makes very little progress in the spring. It may be observed, that the grass of sandy soils appears earlier and also decays sooner than that of other soils. In the winter the sheep of these upper countries are driven to warmer climates to the eastward, and have been known to come as far as Husun Ubdal. It would be difficult to estimate whether the cold or the warm countries here have most grass during the year on a given surface. In the summer, that of the cold is most luxuriant, but in the winter there remains little beyond some withered herbage under the snow; whereas in that season the warm countries have a certain degree of verdure remaining, especially after a shower, and when the surface is free from snow. The nature of the soil too has an influence, and the upper countries are the less productive of grass, as much of their surface is covered with stones. Cabul is proverbial for a scarcity of fodder, but this does not arise from the nature of the soil, but from there being a great number of horses and other animals, and but little ground for pasturage left uncultivated.

121. Khoorasan has a dry climate, and no summer rains; hence its temperate and warm parts have very little herbage. Bulochistan has still less, and Seestan is ill supplied. Sheep and goats are seldom kept in the villages, but pasture during all seasons, at a moderate distance from them. There are indeed certain parts, particularly in the Dooranee country, where the flocks return to the villages after the grass has been burnt up, and are subsisted on straw and other products of agriculture or gardening, with some assistance from the meadows which are not withered by the heat. A considerable part of the Dooranee flocks are driven in summer to the

country of the Ymaks, where they find plentiful pasturage. The Ymaks do not, on the other hand, resort in the winter to the country of the Dooranees, which has less herbage than their own, though warmer, but returning to their *kishlaks*, or winter residences in the vallies, subsist their flocks partly on what grass they can find in good weather, and partly on what has been cut for them in the autumn. The Huzaras, in a climate still more severe, reap great quantities of grass for their sheep, which are seldom unhoused during three months of winter, but sleep under the same roof with their master. Grass is very abundant during the summer in both countries. Bactria too, with the exception of the sandy spaces, is a verdant country and has many meadows, which are always green. In the plains the snow is seldom so deep as to prevent the cattle reaching the grass, but among the hills it is found prudent to provide in part for their provender by a stock of grass, cut in the autumn. The reaping of grass is very common in Kushmeer and in parts of Pukhlee, Bhooner, Swad, Punjkora, Cabul, and Ghuznee, but in general the sheep which have not gone to the low countries are driven out to feed on the shrubs and withered herbage of a hill exposed to the sun, which has been reserved for this purpose. Straw also composes a great part of their food.

122. With respect to Chinese Toorkistan, we have little information. Yarkund and the sandy tracts (see para. 106) have but little grass. Khootun is in this respect much superior, as in most others. As to independent Toorkistan beyond the Oxus, generally considered, it is not inferior to Bactria, but within it we are to distinguish—1st, the dry sandy plains—2nd, the moist plains and meadows—3rd the little and lower hills—4th, the high hills and elevated plains. The first has least grass; the new leaf which had been nourished by the snow is on the 20th March about three inches long; after three months it withers from the heat of the sun. The meadows have abundance of grass, which is continually renewed. Some banks of rivers have a close sweet turf, but the meadows in general afford a deep grass. The lower hills are better clothed with grass than the dry plains, but are not equal to the meadows; their grass has nearly the same periods as the former, and on a given surface perhaps supports during the year an equal number of animals. The hillocks, are, in the country beyond the Oxus, of sand, and bear a scanty grass, which soon withers. In Bactria and Muro the hillocks are of a good soil, and bear good grass. The high mountains and plains of Toorkistan have a grass which makes little progress in the spring, but grows luxuriantly in the summer, sometimes exceeding a man's stature, and it does not wither until autumn; the inhabitants

reap a portion of it for the sustenance of their stock during winter. In the west of Toorkistan this practice is but little known. In districts, such as that of Samarkand, which are well cultivated, the stock, which is not very numerous, is fed on straw or hay. Where natural pasture is near and plentiful, they are driven out to it even in the depth of winter; hence an extraordinary fall of snow causes a great mortality among them. It is still more fatal to the stock of the Kirghizes and Kuzzaks, who inhabit a more rigorous climate, and having little agriculture have less resource when the surface of the ground is covered with snow. They make no provisions of dry grass, in which we are not altogether to blame them as improvident, for some have scarcely a fixed residence for winter; and the flocks are so numerous, that it would be difficult to provide sufficient provender for all. Some of the Kirghizes frequent the Pamer, which bears a most luxuriant herbage, but by reason of the cold it is not pastured more than a third part of the year. On their return, they feed their flocks in the warmer vallies below, until the heavy falls of snow and severe cold force them to retire to their *kishlaks* in the vallies, near which they have left forage remaining for the wants of winter. The sheep remove the snow with their feet, or if too deep they follow the track of the horse, where he has uncovered the herbage. All the animals drink the snow in this season. It is thus the quantity of herbage and its natural seasons, determine the mode of life of a great part of the population.

123. Pasturage may be divided into two species, the shepherd remaining in one climate, or visiting another different from his own. In warm or temperate climates far removed from any other, he feeds his flocks all the year near his own village, and according to the distance, brings them back to the village by night. or not. In very cold climates when circumstances prevent an access to more temperate ones during the winter, they subsist in that season on reserved pasture, on the grass which has been reaped, or on the straw or other products of tillage. But when in the same neighbourhood there are warm plains and cold mountains or upland plains, nature lays the foundation of a more erratic life, the flocks being driven up in the summer and down in the winter. Sometimes there are constant inhabitants in both the upper and the lower countries. It is thus the Ghiljies, who stay in the elevated country of Cabul and Ghuznee, send part of their flocks in the winter to the various warm countries, from the most southern parts of Daman to Koonur and Jellalabad. In the summer the inhabitants of these countries send a part of their sheep to the upper country, but the proportion is not considerable. Sometimes the

habitations of the people are in the vallies and plains, and they frequent the hills and upper plains in the summer—this is the practice of Kushmeer, Pukhlee, Bhooner and Punjkora. Sometimes they reside in the high country—it is thus part of the Kafirs leave their high hills in the winter to pasture their goats among the low ones, and the declivities. The Afreedies too in general stay in the upper part of their country. During the summer the shepherd shelters himself under trees or rude sheds of grass; in the winter he removes to low hills, where he finds natural or artificial caves in the rocks to receive him and his flocks by night. Some of the Dooranees near the Helbund construct habitations for themselves from the branches of trees and mud. The Dooranees, in general, Ghiljies, and Beelochees live under black tents; the Ymaks, Huzaras, and nations of Toorkistan use *khirgas* made of felt and wood, or *kuppas* made of felt and reeds.

124. Some details might be given of the species of plants found in these countries, but they would be little interesting. A considerable number of spontaneous products form articles of food. The chief are the lotus, the ruwash, some of the fungins, a kind of wild vetches, a plant bearing some resemblance to the turnip, the roots of the tulip, the leaves of the plant in India called paluk,* and the seeds of some of the gramina; other plants are used in medicine, and perhaps we have here something to learn of the natives. Perfumes are extracted from others, for instance from the grass which in India is called Gundhel or Mircheegundh,† and which according to some yielded the spikenard of the ancients. The well known dool‡ grass of India seems to extend over all these countries, some parts of which moreover have superior species. Two of these called Rishka§ and Shuftan|| are also artificially raised. The Surkunda appears to extend to the utmost verge of our inquiries to the north-west, and it is not so much from the want of proper grasses as from other circumstances, that in the countries of the west a thatched house is scarcely to be found; a flat roof with a balcony, or a vaulted one without it, are substituted. This last expedient is resorted to wherever wood is dear. Of noxious vegetables, there is none worthy of mention except it be the Bhoart. This abounds in the country of Beekaneer and the neighbouring ones, as far as our military station of Lodhiana, the sandy parts of the great Indian desert, and in some quarters of the country between the Hydaspes and Indus. Its seed which is some-

* A species of beet. † Andropogon, nardus vahl.

‡ Panicum dactylon. Linn. § Sueerne. || A kind of trefoil.

times gathered, and even sold at a considerable price, is covered with several sharp prickles, which readily attach themselves to clothes, and are with difficulty taken out. However insignificant they may seem, they are the chief annoyance to a traveller. Beyond the Indus, and a short distance from its banks, we do not find that grass which yields the khus* so useful during the hot winds in India. In these countries tattees are not much used except in the hottest season, and then only by people of condition. The plant employed is the Juwasat of India, in Peshawar called Jhoy, and by those who speak Persian Shooturkhar, from its being a common food of the camel; besides these uses, in some places it yields manna, for example, the neighbourhood of Candahar and Hirat, and the banks of the Chillehick (see paragraph 45.) This precious substance exudes from it after the spring rains are over, and is collected by merely shaking it off. It is also produced in Toorkistan, on the dark barked or cultivated willow, and from some other plants.

2nd. Of Shrubs.

125. These countries have shrubs and low trees of several varieties and in great abundance. It may be remarked that they are most abundant in unfertile and uncultivated places; whether it be that such is their peculiar situation, or that they occupy places refused by the herbs and succulent plants and by the timber trees I know not. Some insinuate their roots among rocks and loose stones; some grow on the hardest clays and merest sands, and in the driest climates; and others overspread the salty deserts. Though humble, they are however useful, and demand some of our attention.

126. Some furnish food from their roots, barks, flowers, or fruits. The last only is worth mentioning, and the most remarkable species is the barberry, which abounds in the east of Toorkistan, the Ymak country, the skirts of the great northern range, and some parts of that of 34°. It is little cultivated, but that which is raised in Ghæen is much esteemed. The plant in India called Jhurbeereeat extends to the foot of the hills in the northern and western directions. The Byr, which is said to be merely a cultivated species of the barberry, is raised in Peshawar but not in Khoorasan or Toorkistan, where instead of it is cultivated the Connal, a fruit which much resembles it in taste and properties, and is found wild in the hill of Bajour, in Pukhlee, some parts of Persian Khoorasan, and probably many other quarters. On the low hills in the east of Afghanistan, and those south of Kushmeer, which yield

* *Andropogon muricatum*. Linn.

† *Hedysarum Alhaji*. Linn.

berries; such are the goorgoor, moomanee, kookee, simloo, gurinda (the Kurounda* of Hindoostan) and some others. By the banks of streams there is found a plant which bears a fruit intermediate between the raspberry and bramble. The wild grape is found both in the warm and cool climates, but disappears in very cold ones; its fruit is sour, but is sometimes eaten either fresh or fermented. In the countries of the west, sugar being dear, various substitutes are found for it, for example, preparations of dates and other fruits, and a preparation of the sugar melon and honey; but perhaps the most common is what is called Doshab, which is sometimes made of apples or mulberries, but oftener of grapes, wild or cultivated, the juice of which is boiled to a consistence.

127. Where grasses are plentiful, as in Cabul and the cultivated parts of Khoorasan and Toorkistan, a spirit is extracted from them. In the Punjab and Sindh coarse sugar is the chief material from which spirits are extracted, but the inhabitants of the latter sometimes use the date alone, or mixed with sugar, and in the Punjab the same use is made of a fruit called Umlok, which is both wild and cultivated.

In some villages of Cabul a strong drink is extracted from mulberries, and in Kushmeer from pears. In Keerategin, and other parts of Toorkistan, there is a coarse grape called Muska, this they gather, boil, and afterwards dry in the sun. A water melon is now opened at one end, and about nine of these grapes are inserted and forced into the substance of the water melon, which being done, the orifice is shut up by re-applying the piece which had been cut out. In seven or eight days it is found that both substances have fermented, and the pulp of the water melon is converted into an intoxicating liquid fit for home use. But in Toorkistan the favorite liquors are Koomiz, made from mares' milk, and Boza, made from rice; these liquors are both wines, not spirits; they are somewhat acid, and are reckoned wholesome. Koomiz is not considered as coming under the prohibition of the law of Mahomet; but in most of the principalities, especially where the Tajiks bear sway, Boza is strictly forbidden. Although these prohibitions, whether serious or not, are quite ineffectual when they are met by a disposition to elude them, both Koomiz and Boza are less consumed in the great towns than among the pasturing tribes; yet on the whole there is less intoxication among the latter, for the people of towns indulge themselves in opium, the wine of the grape, and

* *Carissa Carandas*. Linn.

various preparations of hemp. Not only in these countries but in most others, intoxication is commonest in cities and crowded neighbourhoods; whether it be that company invites conviviality, and conviviality leads to excess, or that the real and imaginary ills of life being more oppressive where population is accumulated, the miserable are driven to this resource to procure a temporary relief in forgetfulness; a review of these countries will furnish no arguments for the common opinion, that climate influences this part of the character. The force of example is much less doubtful, and the colonies of Persians settled in the Afghan dominions still retain the love of wine for which their ancestors were noted.

128. Very many wild shrubs and wild trees furnish materials for dyeing, but the natives seem to have no secrets in this art. The cultivated dyes are chiefly indigo; turmeric, bastard saffron,* and madder. Indigo is unknown in the countries of the west, which are supplied from Mooltan and the neighbouring countries. Turmeric† is raised in Peshawur and many other places on the east side of the hills, but Bunno and Beer, a district of Pukhlee, are the most famous for it. It is not raised in the cold countries, or in the west. Bastard saffron, a more valuable product, is not raised in very warm situations, and indeed seems confined to Kushmeer and Ghacén. The plant in India called Al‡ is found wild in Bajour and many other places on the east side of the hills, but is not used as a dye, though valued for its cathartic quality. The madder plant does not seem adapted for warm climates, yet some is cultivated in Gunduwah. It is raised at Kilat and Mungoochur, in Bulochistan, and some parts of Toorkistan, but its chief seats are Zumundour, and the country from Cabul to near Candahar. What comes to India chiefly passes through Candahar and Shikarpoor. Logwood, or rather sapan§ wood, grows on the mountains of Kushmeer, but whatever conjectures may be formed, I have found no evidence of its existence beyond the Indus until we reach Mazunduran. Toorkistan is supplied with it and kermes from Russia.

129. For tanning and colouring leather the bark of the almond, the leaves of the Kushnar|| tree, a shrub called Barik, and many others are used. In all cases a lye of lime and alkalies is required. Leather is ill prepared in Afghanistan, and the people of the hills are fond of

* *Carthamus tinctorius*. Linn.

‡ *Morinda cihifolia*. Linn.

† *Curcuma longa*. Linn.

§ *Caexilpina sappan*. Linn.

|| *Bauhinia* sp.

wearing shoes of undressed leather. Still simpler are those called Chuplee, woven from the leaves of a plant which the Afghans call Muzir, and the Peshawurees, Putha ; it grows to the height of a man, but in general is under that height. It is not found in the cold countries, but extends to a certain height on the east side of the hills, beyond which is Khoorasan and Toorkistan. To the south it is found in some parts of Seeweestan, and to the east it is not known beyond the longitude of Husan Abdal. It is of the palm kind, and perhaps is yet undescribed. It bears a small fruit, which ripens in July. An Afghan will make a pair of chuplees in a single hour during a halt ; they are tied on the feet like sandals. The Kushmeerees make sandals of rice straw.

130. The Assafoetida* plant is produced in great abundance towards the source of the Ghorbund river, and also near Isfizar (which is three days from Furah), and some other places in the west of Khoorasan. It prefers a cool climate, and the only cultivation bestowed on it is to shield it from the sun. Assafoetida is more consumed in India than in the countries of its production, where however it is used in food and also medicinally. Many other shrubs furnish articles for the native materia medica. Blisters are made with the leaves of Kureel, a plant well known in India and also in Peshawur. The plant called Akt† or Uk, has a white corrosive juice, which the Rajpoots give to their infant daughters as a poison, when they do not intend to bring them up. This plant yields charcoal, and is good in tanning, dyeing, and pharmacy. The sacred Toolsee‡ is found in all these countries among shrubs famous for the beauty of their flowers, but the most remarkable is that called by the natives Urghuwan, or Anemone shrub. It grows in some parts of Cabul, Budukhshan, and Durwaz. In Durwaz it grows to the height of twenty feet ; spears are made of its wood, and it is a common fuel.

131. Shrubs are the chief fuel in these countries, generally considered, though there are some districts where more use is made of forest timber or the branches of large trees, and others in which the chief resource is the dung of animals. Caravans sometimes find a difficulty in procuring fuel at uninhabited stages, but few towns can be mentioned where this article is dearer than in our provinces. It is dear in Candahar and Cabul ; and in the latter a great quantity being required, it forms an important part of the expenditure of the poor.

* *Ferula Assafoetida*. † *Asclepias gigantea*. Linn

‡ *Ocimum sanctum*. Linn.

The rich Cabulees chiefly burn the wood of four trees—the mulberry, mastich, oak, and bulhuk, a tree so called in Cabul, and by the Persians *kurghuna*. The poor content themselves with a fuel of shrubs or dung, and the dung of horses is eagerly carried away from the streets. The pasturing tribes bring the dung of sheep for sale, which in the city is used as fuel, but in the villages as manure for grapes. The capital was a good deal distressed in the winter of 1801, when the Ghiljies of the neighbourhood interrupted the usual supplies of fuel.

132. In the Indian desert there is abundance of the plant which, after the Arabians, we call Kali, and the same is found in some other quarters. By the Persians it is called Ishkar, but I apprehend this name is given to some other alkaline plants, particularly to that known to the Hindoostanees under the name of Lance, and which is plentifully found in the Indian desert, and also in the wastes of Khoorasan, Bulochistan, and Toorkistan. In these quarters are at least two other plants of an alkaline nature; the pasturing tribes wash by means of the leaves and flowers of these plants. The Lance is thus used in Jellalabad. A common practice is to burn them and use their ashes. Near the Indian desert great use is made of the ashes of Kali, and many in Toorkistan and Khoorasan use those of the Lance. By the addition of fat a true soap is formed, and this is preferred by the more civilized part of the population. The soap of Hindoostan is superior to that of all those countries, but Toorkistan and Bokhara are noted for this manufacture. In Kushmeer and Bajour meal of the Oord is substituted for an alkali, but in all cases a proportion of lime is added.

3rd. Of Trees.

133. The trees best known in India, for example—bamboo, mangoe, tamarind, neem, bukaen, seesum, sal, the banyan tree, peepul, firs, peeloo, kudum, lusora, bēl, jamun, khinnee, kuchnar, umlats, tota, semur, pakur, moursuree, senjhna, jand, dhak, babool, kyr, burhur, kuthur, aoonla, gondee, kumrukh, toon—are quite unknown in Cabul or the countries beyond it, and very few of them are to be seen in Kushmeer or Peshawur. The bamboo is not known beyond Khanpoor of the Gukhurs, nor is it found in any part of Sindh, or even of the Sooba of Ajmeer. The mangoe is cultivated in Sindh, but Tymoor Shrah unsuccessfully attempted to introduce it at Peshawur. The mangoe is cultivated at Keech, in Bulochistan. The plantain does not bear fruit beyond the 33rd degree of latitude; it is unknown in the cold countries, and does not extend far into Bulochis-

tan. The tamarind and neem become rarer as we leave our provinces, and are unknown in Peshawur, as are the kudum, bēl, khinnee, tota, moursuree, jand, kyr, burhur, kuthur, kumrukh, dhak, and some others. In Jellalabad are lost, in addition to those, the secsum, banyan tree, peepul, lusora, jamun, kuchnar, umlats, semur, senjhna, babool, peeloo, aoonla, and some others. The date tree reaches Jellalabad, but extends no further in this parallel. In the south it extends through Bulochistan into Perna; and in Bulochistan it is very abundant, and a main support of the population. In Kilat however it is not found by reason of the cold, nor is it seen in Toorkistan or in any part of the north of Khoorasan.

134. In India gum is extracted chiefly from various species of the genus mimosa, which includes the kyr, babool, jand, and chhokur, of which the last only reaches Peshawur, but there is a species of mimosa, bearing a great resemblance to the first, but not found in our provinces. It is very common on all the low hills between the Hydaspes and Indus, and is called Pholoo, and yields gum, which besides being useful in medicine is sometimes eaten. It does not grow in the cold climates. It has been used with great advantage as a hedge round a fort. In Cabul and the countries of the west where none of this genus are found, gum is extracted from the cultivated trees of orchards, the jujube tree, the wild almond shrubs, and the mastich. In Toorkistan the gum mastich is used for fixing colours in the dyeing of chintz. These are not the only trees from which gum is extracted both towards India and in the west. The jujube is not seen east of the Indus, perhaps is not seen east of the valley of Cabul, but there, and in the west, it exists both wild and cultivated. The mastich is not very abundant on this side the Indus, but beyond that river it is found on most of the hills, except the warmest, and it bears the cold of the Huzara mountains. To the west it extends to Persia, and in a northern direction it crosses the Jaxartes. It is seldom found far from hills.

135. There is a certain plant in Toorkistan, and elsewhere, which is called Seehuk, and its roots yield a coarse resin. The pine species yield the best, and tar is also extracted from them. In remote situations it is more common to rive the tree with wedges than to saw it into planks. Pines are not found in all situations even of the cool countries, but prefer the steep sides of hills, never being found indigencus to plains or tame featured hills. There are some now growing at Herat planted by the late Nooa Moohummud Babunee. They are plentifully found on the sides of the great northern range, and the Bebur,

(with their various branches of a steep character and moderate height,) in the middle of the range of 34° , in nearly the whole of that of $32\frac{1}{2}^{\circ}$, in the beginning of the salt range, on the mountain called Tuchtli-Sooliman, on the lofty mountain Bunseekurn, and the Jadran range, on the Ootman Khel hills, on the Aktan hills in Toorkistan, and some of the mountains of Chinese Toorkistan. Pines are also found in some spots of the Kokur country; Cabul is supplied from the mountain of Kulkucha, about three days to the east. Bameean, Ghuznee, the Huzara and Ymak countries have no pine trees. Some are found in a few spots of Bulochistan. The natives distinguish at least seven kinds, but all are not found in the same quarters. Toorkistan and Kushmeer do not seem to possess that species which is called Julghoza, and which bears a large cone, the seeds of which are idly supposed to possess many good qualities. Another species by the Afghans called Shouty, is remarkable for its being so combustible that the natives use it as a torch; this too seems unknown in Toorkistan. I have received no hint of the larch or any other deciduous species of the pine being found in any of those countries. It may be observed, that the fall of the leaf does not take place even in the same species at one time in climates so different. In Peshawur most trees retain their leaves till near spring, but in Cabul, Khoorasan, and Toorkistan the autumn frosts shed the foliage.

136. Evergreens, besides the pines, are but few. It may be conjectured holly grows on the lofty mountains, but I have never received any hint of it. The cypress is chiefly known as a cultivated tree, but is found wild in some situations. Excepting it, the natives reckon the chinar or sycamore, the most beautiful of trees. Some are found at Lahour, but are certainly not indigenous. There are two species, the Chinara or Sufeda, which has a broad shade, and the Punja-chinar or Sufedar, which grows slender and tall. The Chinara is indigenous in Kushmeer, Khost of Bunnoo, Georzwani in the Ymak country, Durwaz, and various other situations. It prefers a moderate climate inclining to cold, deep valleys, and a moist, fat soil.

137. The same situations are most favourable to willows, but some of them are seen growing in all climates, from the plain of Peshawur to the country of the Huzaras. This is perhaps the only tree which withstands the cold of the Pamer. The willow is banished only from the hot and dry plains, and some peculiar situations. There are several species, but four are the most known, viz.—the weeping willow, which the natives call Mujnoon, and value for its beauty, the Bedi Mooskk from which is extracted a perfumed water, the green willow which is the commonest of all, and the red, which grows straight and

tall. The two last are used in building, chiefly for rafters of houses, and insects do not eat their timber. All the four species are cultivated, though some more than others. In Kushmeer and some other places the twigs of willows are given to cattle. In none of these countries are osier baskets made.

138. It is probable that the high mountains have some English trees which we cannot identify from the descriptions of the natives. The birch is plentiful in Kushmeer, and also many places of the Belur mountains, yet its bark is imported from Russia into Bokhara, where it is used to stuff saddles—an article there manufactured of good quality. The only species of oak is that known in systems by the name *Quereus Bilote*, which does not become a great tree. It is not found in Khoorasan, or Toorkistan, or in the warmer countries towards India; the Cabulees call it Buloot. I know not what are the trees called Seah, Chob, Bulhuk, Pudda, and Gurung.

139. The mulberry grows wild over a vast expanse of country, yet is rarely seen in the plains. It grows in the vallies of all but the warmest hills. Its fruit is much improved by cultivation, and it has varied into at least twelve varieties, all of them good. There is a difference in their ripening, but the mulberry harvest generally speaking coincides with that of wheat and barley in the same climate. In various parts of Toorkistan the mulberry is very important to the natives, furnishing a fruit, a doshab, and when preserved a considerable article of food. Now here is it so important as in Punjsher, where the natives grind it into flour, and this forms the chief food of the country. The mulberry plantations are so extensive that they are not walled in, and some individuals are said to possess ten thousand trees, but this seems an exaggeration. A very good tree will bear ten maunds of mulberries, and if the average produce be one-third of this, it is calculated to support a far greater population than tillage. The produce is little affected by the seasons and is remarkably equable.

Silk is not made except in certain quarters. Kushmeer raises enough for its own scanty consumption, but Peshawur and other countries of the east are supplied from abroad, chiefly from Goojrat, and our provinces. To the west the first place which produces silk is Gundumuk, in a temperate climate between Cabul and Jellalabad, but there is none in Cabul or Ghuznee; considerable quantities are raised in the Afghan Khoorasan, but less than in the Persian part of the province and in Toorkistan. Great quantities are raised in Khootun.

140. The pistachio tree is confined to Toorkistan and that side of the Paraparnisan which lies towards it, but it is little cultivated. The wild

almond shrub (which when cultivated attains a great size) is very common in many places, but its fruit is not eatable. An oil esteemed in medicine is extracted from the stones both of this and the cultivated sort. The oil of walnuts is so cheap in Kushmeer, that it is more used in food than any other oil or fat. The tree requires a colder climate than the mastich, but like it is found in the very cold ones. Where it is naturally very abundant, it is not cultivated. A good tree in perfection will bear, it is said, forty thousand walnuts in a season, and two thousand in Cabul fetch a rupee when cheap. The wood is good for some purposes, by reason of its strength and hardness. The natives are not accustomed to use olive oil in their food, but apply it to medicinal purposes: this plant grows on most of the low hills. Though it is not found in Cabul, Toorkistan, or Khoorasan, it is plentiful in some places between the Euxine and Caspian.

141. Nearly all the species of fruits cultivated in these countries are also found natural in some parts of them, chiefly in the vallies of cool and cold mountains. These are the apple, pear, cherry, plum, apricot, peach, quince, and pomegranate. The fig, though found in most of these climates seems yet to prefer the warm. The *naring*, a species of wild orange, grow on the hills south west of Kushmeer.

142. Of these countries Kushmeer has probably the greatest variety of indigenous species, and is at the same time as well wooded as any. It may be remarked that the same situations are generally well wooded which have been already described as favourable to the pine (see paragraph 135), the steep sides of hills being favourable to its growth, whether it be that forest trees love shelter, or because they are here best secured from animals. The low hills are not so woody as the high, being more affected by shrubs and low trees of little use as timber, than by forest trees. On the whole these countries are but ill wooded, though superior to Persia. Toorkistan, excluding the deserts of the west, is on the whole superior to Afghanistan, and the northern part of that country to the southern Bulochistan has very little wood. The plains of these countries have naturally but few trees and (contrary to what takes place in most countries of Europe) they become better wooded with the progress of cultivation. Few of the natives plant for timber, but a good deal is yielded from the numerous orchards of the countries of the west, which have been planted for fruit.

(To be continued.)

ART. II.—*Journal of a trip through Kunawur, Hungrung, and Spiti, undertaken in the year 1838, under the patronage of the Asiatic Society of Bengal, for the purpose of determining the geological formation of those districts.*—By THOMAS HUTTON, Lieut., 37th Regt. N. I. Assistant Surveyor to the Agra Division.

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PART I.

Towards the close of the year 1837, a proposal was made to the Asiatic Society of Bengal, to undertake, with their patronage and assistance, an expedition into the Spiti Valley, where the late Dr. Gerard, some years since discovered the fossil exuvæ of marine mollusca; but which interesting discovery was never followed up by a close examination of the geological formation in which they occurred.

The proposal meeting with the approbation of the Society, I proceeded with as little delay as possible to Simla, whence in a few days having completed my arrangements, and procured all necessaries for the journey, I started on the 14th of May, 1838.

So many travellers have at various times passed over the first four stages of my journey, and the appearance and productions of the country from Simla to Kotgurh have been so often described, that it would be tedious to repeat the information already published; and I shall therefore pass over the four first stages of my trip and commence my notes from the military post of Kotgurh, where I arrived on the 19th of May.

Here previous to starting for Kunawur, I received a visit from a vuzeer of the Bussaher Rajah, who, at the kind suggestion of Colonel Tapp, the Political Agent, furnished me with some information regarding my route, and also sent with me one of his Churriahs or Chupprassees, to accompany me as far as Spiti, in order to procure provisions for my followers, and to give any assistance which his knowledge of the people and their different dialects would enable him to furnish.

From Kotgurh, the road winds down a steep and somewhat sudden descent of about four thousand feet to the bank of the Sutledge, along which it continues, with an occasional moderate ascent and descent, to the village of Dutnuggur, which is generally the first stage towards Rampore.

To avoid as much as possible the heat of the march, which along the bed of the river is little inferior to that of the provinces, I took the



*pugdundee*, or village road across the brow of the hill, by the village of Logo, where iron is procured, which is also a nearer route than by the descent to Kaypoo. A walk of about three miles and a half brought me gradually down to the Sutledge, where the thermometer which at Kotgurh at sunrise stood at  $54^{\circ}$ , now rose at ten o'clock A.M. to  $98^{\circ}$ ; this sudden change of climate from temperate to torrid was by no means an agreeable transition to a pedestrian traveller, with more than half his march still before him. Passing the village of Neert or Neertnuggur, a few miles farther on brought me to Dutnuggur, and the end of my day's journey, right glad to seek a rest and a shelter from the burning sun, beneath the grateful shade of a large burgut tree.

The presence of this beautiful tree is of itself sufficient to stamp the character of the climate of Dutnuggur, and looking around we find along with it the peepul, the bukkine, the pomegranate, and the plantain, with many shrubs abundant in the hot provinces of India. All these, with the exception of the burgut, are indigenous to the soil, but that noble tree was long since brought from the plains by some traveller now many years dead and gone, and the date even of its arrival is now alike forgotten with the name of him who brought it.

Beneath the shade of its spreading branches I pitched my tent, and amused myself until the arrival of my baggage, with watching the parrots and minas as they threw down in showers the red fruit with which the tree was loaded; even in this delightful shelter the thermometer stood at  $92^{\circ}$ , while in the sun it rose to  $120^{\circ}$  at 12 o'clock.

Those who have figured to themselves the valley of the Sutledge to consist of a large river winding beautifully through a broad and fertile vale, well cultivated and studded with habitations and villages, will feel a degree of disappointment and surprise, on finding it in reality to be no more than a steep and rugged mountain glen of unusual grandeur, with a broad and rapid torrent roaring and foaming as it rushes impetuously along the bottom over the fragments of rock, which everywhere strew its bed, causing its waters to curl and rise in waves, which hurl the white spray on high, and give to the surface of the stream the appearance of a ruffled sea.

Broad and fertile valley there is none, but in its place are frowning hills rising high on either side from the water's edge, clothed, and that scantily, with tufts of grass and shrubs, while near their ragged crests are scattered dark groves of bristling pines, giving to the scene an air of stern and bold magnificence, which cannot fail to impress the traveller with an idea that some vast and more than usual agent has been the means of stamping the landscape with unwonted grandeurs.

The banks and bed of the river are thickly strewed with rolled and water-worn fragments of every size, from the pebble to the mass of many pounds in weight, and seemingly brought down from great distances, as many of them evidently belong to formations which do not occur in these lower parts.

Boulders of quartz of gypsum, hornblende and mica slates, porphyritic gneiss, sienite and sand stones, are heaped together in confusion along the river's course, while here and there above the stream are vast beds of the same rolled stones embedded in clay and debris. These are situated solely at the lower part of the valley, commencing a little above Rampore, and increasing in magnitude from thence downwards; they are chiefly, if not altogether, situated at those places where the river takes a rapid turn, and have evidently been thrown up or deposited in the back current or still waters of the deep floods, which must have brought down the sediment and stones of which they are composed. These vast deposits of alluvial matter are horizontal, or rather preserve the line of level of the river, and upon their wide and flattened surface the traveller is pleased to see a rich and smiling cultivation. These beds are sometimes far from each other, at other places they extend along both banks of the river, by the action of whose current they have evidently been severed. Upon such are the villages of Neert, Dutnuggur, Kaypoo, and many others on both banks built, and surrounded by a beautiful and luxuriant vegetation.

Rivers of the present day are known to accumulate and deposit large beds of sand and other debris in the eddies or back waters which they make when winding through rocks or strata of unequal hardness, but these deposits of the Sutledge are not the gradual accumulations of months and years, but from their massiveness and the enormous blocks or boulders which they contain, must evidently owe their origin to a larger body of water than is now supplied even in the rainy season; they must owe their origin to some vast and perhaps oft-repeated floods from the upper parts of the district, such as the sudden outpouring or bursting of some extensive lake, which has brought down and deposited vast fragments of rocks, whose true site is situated many miles from the deposits which now contain them, and which tower up for two and even four hundred feet above the river's present level.

To state here the causes from which these beds have sprung would be to anticipate, and we shall see as we travel onwards into Spiti, that a solution is presented in the appearances which that valley exhibits.

Towards evening, the clouds began to gather thick and heavily, and

thunder growled nearer and nearer, preceded by a gale of wind that nearly tore my tent away. The rain came drifting up the valley, and curiously, but very civilly, kept the opposite bank of the river to where I was encamped, shrouding the mountains from my sight as it passed along, without even giving me a sprinkling.

The harvest had commenced at Dutnuggur as also at Kotgurh, and the sickle was in the field. In some instances the reaper and the plough were at work on the same ground, the one preparing the soil for the second crop, almost as soon as the other could gather in the first one. The first crop here consists, as in all these lower parts, of barley, wheat, poppies, and some minor grains, which are ripe in the months of May and June, when the fields are again made ready and sown with the autumn crop.

On the morning of the 21st, I resumed my pilgrimage by a good broad road along the left bank of the river, and a walk of nine miles brought me to Rampore, the capital of Bussaher.

After leaving Dutnuggur, there is scarcely any cultivation on the left bank of the Sutledge, owing to the rocks rising more abruptly from the stream, between which and their own base there is sometimes little more breadth than what is occupied by the road; at Rampore, although the town stands upon a broad flat at a turn of the river, there is no cultivation, except a few gardens in which the burgut again appears.

This place is therefore strictly speaking a manufacturing town, where those of its inhabitants who are not engaged in travelling with grain into Ludak and Chinese Tartary, are employed in the manufacture of pushmeena chuddurs, which are made from the under wool of the Tartar goats, called by the people "pushm" whence the word "pushmeena". These chudders or shawls are sold according to their quality and texture at from fourteen to twenty-five rupees each.

Rampore is also the winter residence of the Rajah, and is selected on account of the mildness of its climate at that season. To avoid the great heat which it experiences in summer, he usually repairs with his court to Sarahun, which from its greater elevation is free from such intense heat as is felt at Rampore, whose elevation is only 3,400 feet above the sea, while Sarahun is rather more than 7,000 feet, or about the height of Simla.

It is here that in the beginning of November the great fair is held, which draws together the people from the upper hills to barter the produce of those elevated tracts for that of the lower hills and plains. Here may be seen commingled in one grotesque assemblage the Tar-

tars of Hungrung, of Spiti, of Ludak and Chinese Tartary, with the inhabitants of Kunawur, of the lower hills and plains, and sometimes also with those of Europe.

Among these different tribes little or perhaps no money is exchanged, but the dealer in tobacco or grain offers to the seller of wool or woollen cloths an equivalent quantity of merchandise for that which he requires, and thus in a very short time the produce of either country or district has changed masters.

The greatest good humour and mirth prevails at this periodical "gathering of the clans," and few quarrels occur. Should two dealers however happen to fall out, or, as sometimes occurs, should the wine cup have been used too freely and broken heads ensue, the Rajah levies on the disturbers of the peace a fine according to the circumstances of the delinquents, which is paid in anything they may possess, whether money, sheep, or merchandise.

At this season the articles brought into the market from the upper hills, are blankets and sooklat from Lubrung, Khanum, Soongnum, and other places in upper Kunawur;—raisins, neozas, cummin seed, sheep, goats, and ghee from the lower parts;—chowrees, birmore, pushm wool, byangee wool, silver and gold dust in small quantities, borax and salt, numdahs, &c., from Ludak and different parts of Tartary.

These are exchanged for opium, celestial barley and wheat, tobacco, iron, butter, ghee, treacle or ghoor, linen cloths, brass pots, &c. all of which meet with a ready and profitable sale in the upper parts of the country.

Within the last three or four years, the traders from Ludak have purchased opium, which they did not take previously. Ghee is not purchased for Ludak or Tartary, but butter is taken instead, and forms a great ingredient in the mess, which they make of tea and flour, and which forms their food, as the chupattee or bannock does that of the low country people. It is purchased at Rampore at about eight seers for the rupee, and sells again in Tartary at four and five seers, so that cent per cent is no uncommon profit on this one article. Tobacco is also in great demand, and always brings a good profit to the trader.

Of the different articles manufactured in the upper parts, I shall again have occasion to revert in speaking of the several places where they are made, and I shall therefore pass on to the Rajah and his court, ere I take leave of the capital, and plunge into the woods and forests of Runawur. The Rajah is an ugly, common looking fellow, of about thirty years of age, and is of the Chuttree caste of Hindoos.

He is married, but has no legitimate offspring to succeed him, although he has a son and a daughter by some mistress or frail damsel, who doubtless, like a highland lassie of the olden time, would have thought it a crime to refuse the laird anything in her power to bestow. Should he die and leave no legitimate heir to succeed him, his territories will fall to the British Government.

He has three chief vuzeeers who manage the affairs of his territories, and who in time of war would take command of his forces, as it is contrary to the custom of the country for the Rajah to do so in person. These three are equal in rank, and their office is hereditary.

Below them are several inferior officers also called vuzeeers, whose office is not hereditary, but who are elected or rather nominated by the Rajah annually, and they seem to be thannadars of different pergunnahs; among this class is Puttee Kaur, Dr. Gerard's friend, who has lately been appointed vuzeer of Hungrung. The personal attendants or immediate household of the Rajah, consists of two sets of men called Churriahts, and Hazrees.

The Churriaht derives his name from part of his duty being to carry the Churree, or silver stick, on occasions of ceremony before the Rajah. His duties are chiefly those of a Chupprasseer, and he is sent into different pergunnahs to collect the revenue, to report any misconduct, and to see that the people are equitably assessed, that is, to point out who may be taxed more heavily, and who should be excused,—and in fact, to ferret out and report to the Rajah the conduct and circumstances of all his subjects.

Those who are smart, and acquit themselves to the satisfaction of their chief in this system of espionage, are usually high in favour, and receive occasional substantial presents in token of his approbation, while those who are lukewarm, lazy, or who are wanting in tact, get nothing but their trouble, for the Rajah gives no pay to his servants, their services on the contrary being compulsory.

The Churriahts form a body of from sixty to eighty men, never exceeding the one or falling short of the other number; they have three officers who, in the language of the country, are called "Pulsur," "Buttoong-gee," and "Naigee," answering to Soobadar, Jemedar, and Burkundauze. They are exempt from military service, and remain with the Rajah. They are drawn from the district of Kunawur, and are compelled to obey summons, unless it graciously pleases his Highness to excuse them, in which case however he takes good care to exact a fine for their non-attendance.

Some wisdom is shown in the selection of this body, as none are

taken but men in easy circumstances, who possess either lands or flocks, the Rajah rightly thinking that those who are well off, will be more likely to keep a sharp eye on the discontented or troublesome characters, than those who have all to gain, and nothing to lose. He has also the satisfaction of reflecting that in case of misconduct they possess the means of paying a heavy fine.

The Hazrees are a larger body of men than the Churriahs, and they sometimes perform the same duties, but in general they act as Chowkeydars or guards to the Rajah, being distributed round his camp or his palace by night, in a chain of sentries. They consist of one hundred and forty men, and have one officer called a "Gooldar"

Of their number, however, no more than forty or fifty of the smartest are required to be in attendance; the others are suffered to remain at home. They are fighting men, and in time of war would join the forces.

There is no standing army or any regular soldiery since the British Government extended its protection to Bussaher, and even before that time it resembled an half-armed mob, rather than a military force, having no uniform, and each man being armed according to circumstances, some with matchlocks, some with swords, and others who possessed neither, arming themselves with sticks and branches of trees.

This rabble was commanded by the three vuzeers if the enemy was in force, or by two or one according to the exigency or trifling nature of the disturbance.

The Rajah pays a tribute of 15,000 rupees annually to the British Government, which is levied in coin on the inhabitants according to their circumstances, some paying two annas, others four annas, and onwards to ten rupees, which is not exceeded except by the three vuzeers who pay twelve rupees each annually.

The amount of private revenue which the Rajah himself derives from Bussaher is very uncertain, and cannot be fully ascertained as it is paid in kind, consisting of lambs and kids, blankets, and other manufactures, wool, neozas, raisins, and rice from Chooara, across the Burenda pass, which is I believe the only grain he receives. If the season be bad and the flocks are sickly, or the young ones die, that portion of the revenue is excused for that year, and so likewise if the fruits or crops fail, so that his revenue varies according to the goodness or unfavourableness of the seasons. It may perhaps be roughly computed at from fifty to fifty-five thousand rupees annually.

For crimes and misdemeanours, fines are levied according to the

nature of the offence and the circumstances of the offending parties, these fines though nominally amounting to a certain number of rupees are always levied in goods.

Thus when the village of Junggee in Kunawur neglected to furnish me with coolies to carry my baggage, the Rajah ordered a fine of one hundred rupees to be levied on the inhabitants, which was to be realised in anything they had to give. The same punishment would have been inflicted on the Churriah who accompanied me to Spiti, had he refused to go. When the Rajah ordered him to prepare for the journey, he was on his way to Simla, to be present at his master's interview with the Governor General, and having already been in Spiti he felt no desire to return to it, consequently he declined going, and offered to pay a fine of five rupees if the Rajah would excuse him and appoint somebody else; but the Rajah turning to him said,—No, no, if you disobey my orders I shall not ask for five rupees, but make you pay one hundred. This was enough, for bad as was the prospect of a journey into the dreary district of Spiti, far worse for the Churriah would have been the infliction of such a fine, and he therefore departed without another word.

From Rampore to Gowra, the next stage is a long and fatiguing ascent all the way. The road winds up the side of a very steep hill, and is strewn with blocks of stone, so thickly in some places as to resemble the bed of a torrent rather than the high road between the Rajah's summer and winter residence.

The first part of the ascent is over a nearly bare hill, but the scenery improves farther on, and the way is cheered by the occurrence of a scattered forest of oaks, mulberries, rhododendron, and the "*Pinus excelsa*" or Cheel. From the crest of the ascent, a pretty view is obtained of the surrounding country; a small amphitheatre is spread beneath, the foreground consisting of gradually sloping hills shelving away towards the river, which winds along unseen below. This slope was studded over with the bright hue of the ripening crops, while round them rose thickly wooded hills, backed in their turn by the dazzling splendour of the snowy range.

From the brow of this hill the road dips suddenly down again into a thickly wooded dell, from whence it rises on the opposite side to the village of Gowra. Thinking to avoid this second ascent, I followed a bye path through the forest, and a precious scramble I had of it. The soil was so thoroughly impregnated with decomposing chlorite, that it was with some difficulty I could manage to keep upon my feet, from the greasy saponaceous nature of the rock; and when at last I

reached the stream at the bottom of the glen, from which the road again ascended, I found that the pugdundee I had chosen to follow led along the side of a hill which was daily yielding to the weather, and falling down in masses, which left a nearly perpendicular mural cliff to scramble up. Hands and knees were in some places necessary in order to avoid slipping back again, and this by the greatest exertion. We passed over some masses which the weather had detached, and which were actually tottering to their fall, and were hanging almost by nothing over the deep glen below. On my return to this place, two months and a half afterwards, in the rains, these masses had all been hurled down, and their fragments were scattered in the bed of the stream; yet another pathway had been made by the villagers to save a mile or two, and it is doubtless doomed, like its predecessors, to fall at no distance of time into the glen. This time I preferred the steepness of the road, to the wet and slippery pugdundee. We managed however to get over safe enough, and my people gave me Job's comfort, by telling me there were far worse roads ahead! Save me, thought I from bye paths in future, and I felt by no means inclined to exclaim with the courtier in *Bombastes*, "Short cut or long, to me is all the same!"

Gowra is a small village, and contains but few houses. It is situated far above the Sutledge, which winds along unseen in the depths below, and the hoarse roar of its turbid waters is even scarcely heard. Here were apples, apricots, mulberries, and citrons bearing fruit, and the barley was nearly all carried from the fields.

In the woods around the village plenty of game is found, such as the monal, college pheasant, black partridge, and chikore. At this place I halted on the 22nd of May, and the next morning after a walk of an hour and a half arrived at a small village called Mujowlee, where I again encamped, as the rest of the way to Sarahun, which is the proper march, was all up hill, and had I attempted it, my baggage and tent would not have arrived until night, and I should have got no dinner into the bargain, which to a traveller in such a country is by no means either pleasant or comfortable. The road from Gowra to Mujowlee is very good indeed, and vies in some places with those of Simla; it lies through very pretty woods of oak, firs, mulberry, and many others common to the lower hills; the wild dog-rose with its snowy flowers, spreading over the tops of the underwood or climbing high into some tall oak, was in abundance, and almost every villager had a thick roll or necklace of the flowers hung round his neck, or stuck in a bunch on one side of his bonnet.



From Mujowlee we descended into a steep khud or glen, at the bottom of which by a frail and ricketty sangho of twigs, which is continually carried away by the rise of the waters, we crossed a stream which runs down and joins the Sutledge about a mile or two lower. From this we toiled up a long and steep ascent on the side of a hill, very prettily wooded with oaks, firs, horse chesnuts, walnuts, peaches, apricots and bukkines, intermingled with the raspberry, blackberry, and white dog-rose. The number of fine mulberry trees which for the last few marches had every where occurred near villages, led me to inquire if the silk-worm was known to the people, and if so, why they did not import and cultivate it. Such an insect it seemed had been heard of, but nobody appeared to know what it was like, nor had any one ever thought of introducing it to the hills; and the reply was, "We are hill people, what do we know of silk-worms?"

Nevertheless I see no reason why the insect should not thrive well in these villages along the Sutledge, where the summer enjoys a warmth unknown to Europe, and where the winter is certainly not so severe as in our native land. Food for the insect is in abundance, and is at present useless. At Simla, in the summer of 1837, I saw many caterpillars of a species of silk-worm feeding on a mulberry tree, in a garden there, which shows that very little care would cause it to become an useful article of trade in the lower hills. It is indeed very probable that the insect does already occur in the places I have alluded to, although it is at present unknown to the inhabitants, who are too busily employed in the cultivation of their fields to bestow a thought on "Entomology!"

Were the insect introduced, and the people instructed in its management, which could be easily done by sending skilful hands from the plains, I have no doubt, from conversations which I held with them on the subject, that they would gladly give their attention to its cultivation; but the introduction of it must be made by those who are in some authority, as the people themselves are far too poor to run the risk of expense which any experiment might entail upon them.

After gaining the summit of the ascent from Mujowlee we leave the pergunnah of Dussow, and drop over the frontier ridge of the district of Kunawur, arriving by a short and gradual descent at the town of Sarahun.

This is the usual summer residence of the Bussaher Rajah, who flies from the heat of his capital in the month of May, and returns again in time for the annual fair of November.

The elevation of Sarahun is about 7,300 feet above the sea, and it

is situated in a beautifully wooded recess or amphitheatre formed by the hills advancing round it in a semicircle behind ; while in front they slope down in the direction of the Sutledge, from which, again on the opposite bank rise the dark and usually barren hills of Kooloo.

The heights all round were in the month of May still deeply covered with snow, which however does not remain, but melts away as the rainy season sets in.

The village of Sarahun, for it cannot be called a town, has a shabby and ruinous appearance, and except at the season when the Rajah honors it with his presence, is nearly deserted. It boasts of no manufactures. At the time of my arrival the Rajah had gone to Simla to wait upon the Governor General, and having on this occasion drawn around him his retainers, the place was left with scarcely an inhabitant, except a few old women and children.

Journeying onwards from Sarahun, the road was at first tolerably level and easy, but after a mile or two it changed to a steep ascent over stones of all sizes, and sometimes overhanging the khud at places where the weight of snows had caused the whole to slip down, and where a plank or the trunk of a tree had been thrown across the gap to supply the deficiency.

The whole way was however very pretty and well wooded, and we crossed two or three streams which came rushing down from the snows on the heights, to join the Sutledge below us. One of these streams at eleven A. M. had a temperature of 45°, while the air at the same time was at 89°. From the ridge of the hill we descended for some way through a beautiful forest, in which at last, after a walk of eight good miles, we encamped at noon, surrounded by oaks, rhododendron, walnuts, horse chesnuts, apricots and mulberries ; many of the horse chesnuts were magnificent trees, and covered with their conical bunches of flowers, which with the scarlet blossoms of the rhododendron arboreum, gave a pleasing effect to the surrounding scenery. In one part of the forest we found vast beds of a large flag iris in full bloom, and quite distinct from the small species which I saw on my way to the Burrenda pass in 1836. It is not perhaps generally known that the fruit of the horse chesnut produces a beautiful and permanent dye, and as it may be procured in some abundance in the hills, the following recipe, taken from the Saturday Magazine, may not be unacceptable to those who residing in the hills, may wish to avail themselves of the produce of the country.

“ The whole fruit of the horse chesnut cut in pieces when about the size of a small gooseberry, and steeped in cold soft water, with as much

soap as will tinge the water of a whitish colour, produces a dye like anotta; the husks only, in the same manner with cold water and soap, produce a dye more or less bright according to the age of the husk. Both are permanent and will dye silk or cotton, as much of the liquor as will run clear being poured off when sufficiently dark."

During the past night at Sarahun we experienced some heavy showers of rain, accompanied by thunder and lightning which cooled the air, and gave us a delightful day to travel in. Many of the heights which before had begun to look black from the melting of the snows, were now again completely covered with a sheet of dazzling whiteness. The day continued cloudy with some heavy showers in the afternoon, and snow appeared to be falling heavily over all the neighbouring peaks.

Several flocks of sheep and goats passed our encampment during the day, on their way from Rampore to the upper parts of Kunawur; each animal was laden with flour, which is carried in small bags thrown across their backs and confined there by a crupper and band across the chest, with another under the belly, answering the purpose of a girth. Each carries according to its strength from six to twenty seers\* in weight, and they form the chief beasts of burthen throughout the country, travelling ten and twelve miles daily with ease and safety over rocky parts where mules and horses could not obtain a footing.

From this encampment we continued our march, still through the forest, to the village of Tranda; the road in many places was very precipitous and rocky, and numerous rudely constructed flights of steps occurred at those places where the ascent was too abrupt and rocky to cut a road. Before climbing the last steep hill to Tranda we came to a deep glen, with a roaring torrent hurling itself along towards the Sutledge with headlong fury; over this had once been a goodly sangho bridge, composed of three trees thrown across from rock to rock, with planks of wood nailed transversely across them, but the weight of the winter snows had thrown the bridge all on one side with an awkward slope to the gulph below, and had torn half the planks away, leaving wide intervals at which there was nothing left to walk on but the round trunk of a single tree; and the dazzling foam of the waters seen beneath as the torrent rushed along, imparted to the passenger the feeling, that the crazy bridge was gliding from beneath his feet, and made it dangerous to attempt the passage. Two only of my people crossed it, and they were laughed at for their folly.

\* A seer is 2 lbs.

A flock of sheep arriving while we were deliberating on the best method of crossing the stream, decided our plans at once. It was impossible for even these sure footed animals, laden as they were, to cross in safety, at least their owners would not run the risk; and in a short time therefore young trees were felled and placed across a narrower part of the stream, and covered over with bundles of twigs laid on transversely. Over this the sheep led the way unhesitatingly, and we followed in their wake. From this we climbed the ghat to Tranda, where I encamped amidst a forest of majestic Kaloo pines. From Tranda I proceeded to Nachar, a pretty walk of about eight miles, some parts being steep and rugged. The road at first ascended for a short distance, and then turning round the hill brought us to a steep descent, down which it fell somewhat abruptly in a zigzag manner to the bottom of a wooded glen. In many parts it wound backwards and forwards so suddenly, from the steepness of the hill, that on looking upwards it was no pleasant object to behold the long train of my baggage coolies slowly winding downwards in a zigzag line above my head, and while thus standing below the crazy looking scaffolding, which in many places formed the road, I could not help thinking to myself, "If those fellows with their loads should chance to come tumbling through, how terribly they would spoil the crown of a certain gentleman's hat,"—and the feeling made me hasten on to avoid the fancied, but not improbable danger.

Nachar is a small village situated at some height above the Sutledge, on the slope of the left bank. The thick forests and rocky glens from this place downwards to Sarahun, may be deemed the head quarters of the *Gooral* and *Thar* antelopes, the latter being known here by the name of "*Eimoo*." Thèr, and black and red bears are also met with, the first and last inhabiting the higher and colder portions of the range.

Bears are not found generally throughout Kunawur until the season when the grasses are ripening, and it then becomes a matter of great difficulty to prevent the vineyards being robbed at night.

Large dogs and men at this season keep nightly watch, making a continued shouting and firing of matchlocks to keep off the invader. They also commit sad havoc in the autumn crop of phuppra. At other times they are said to retire to the higher parts of the forests, where they lie concealed among the deep caves of the rocks, feeding on various roots and acorns. The Thibet bear is abundant on the heights above Nachar, as also the red variety. Here they are both said to attack and kill sheep and goats, and they are often such a

nuisance that it is considered a feather in a man's cap to shoot one. The elder brother of the Churria who accompanied me to Spiti had killed no less than fifteen bears, and was looked upon as a Nimrod in consequence.

The red variety is said to differ in nothing from the common black or Thibet species, except that it is red while the other is black. Both are said to possess the white band across the breast, but that it is constant in neither. I strongly suspect that subsequent research will prove that there are at least *two* if not *three* distinct species in these hills, namely, the Thibet bear, the red bear, and another black species without the white crescent on the breast, of smaller size and greater ferocity.

The natives say, both black and red live together in the same haunts, and that when both come down to feed at night in the vallies, the red one does not always return to the heights, but remains in the lower haunts of the black bear. If this statement be correct it would argue a greater difference in the species than that of colour, for why should climate act on some and not on all, since all are in turn found equally near the snows. If colour were the only difference, then the red one by staying in the haunts of the black bear would resume his former colour, and the black one by going to the heights would become red; but as this is said not to be the case, and that both black and red can reside together either high or low, it goes far to prove a specific distinction; the red bear is however found chiefly near the summits of the ridges, while the black one inhabits the lower and more wooded tracts in the thick forests of oak, where they feed upon the acorns and other fruits. Both species in the autumn make nightly incursions into the fields of phuppra, which they destroy in quantities, and they also in the summer approach the villages and steal the apricots.

In the winter time when food is scarce they are said to tear down the wooden hives, which are built into the walls of the houses, and to devour the honey, nor is this the extent of their plundering, for they have been known to force open the door of the sheep house, and run away with the fattest of the flock. A lad who accompanied me, hearing the questions I asked regarding these animals, very gravely declared that when the bee-hives were too high to be reached from the ground, the bears went to the forest and brought a long pole, which they planted against the wall and used as a ladder! We all laughed at this thumping fib, which was evidently made for the occasion, but he only persisted in it the more, and at last swore that he had seen them do so!!

Some are said to store their dens with grass and herbs, in which they keep themselves warm during the prevalence of the snows; others select the hollow trunk of some large decaying tree in which they form a similar warm bed. This however I look upon as a fable. There are not many about Cheenee and Punggee, and above those places they are not founded; the greatest numbers therefore inhabit the lower parts of Kunawur.

During the winter in those parts where the Emoo, the Gooral, and the Thér are found, it is the custom when the snow has fallen somewhat deeply, so that the animals cannot avail themselves of their natural speed, for parties of eight and ten men to assemble with their matchlocks and sally forth to the chace, guarding their legs from the snow by two pairs of woollen trowsers, and a warm thick pair of woollen shoes. He who is lucky enough to get first shot at the quarry is entitled by the rules of the Kunawur sporting clubs, provided he has fired with effect, to the skin of the animal, and the rest of the party share equally of the flesh, whether they have had a shot or not. The skin is the most valuable part of the prize, and out of it many useful articles are made, such as soles for their shoes, bags to carry grain and flour, and belts, &c. so that to get the first shot at the game is not only as much a point of honour as getting the brush in a fox hunt at home, but is also a source of profit to the lucky sportsman.

The bear is not held in much dread by the people of Kunawur, for in the season when they have young ones parties go forth to the chace with a few dogs and armed only with heavy sticks. When a bear with cubs is unkennelled by the dogs she at first makes off in great alarm, but as the dogs soon overtake and keep the cubs at bay until the huntsmen come up, she retraces her steps and wages war in defence of her young. Some skill and agility are now required by the hunters to avoid a hug, and at the same time to administer some weighty blows over the animal's head and snout, until having received a hearty cudgelling from the party, she once more makes off after her cubs, who have profited by the delay to get well ahead. The dogs however again overtake them, and again and again the poor mother returns to defend them, and receives a thrashing, until tired and exhausted she secures her own escape and leaves her offspring in the hunter's hands. Bears and leopards are sometimes killed by constructing an immense bow, charged with one or more arrows. A bait is placed to entice the animals, and connected with the bow string in such a manner that when seized the arrows are discharged into the animal's body, and with such force as often to pierce

it through and through. The skins are cured and sold at a rupee and two rupees each to the Tartars and Lamas, who take them to the upper districts and dispose of them at a profit, or make them into shoes, &c; opposite to Nachar, on the Kooloo side, the wild dog is also said to be abundant, but so difficult is it to get a sight of the animal that the natives never go in quest of it, and indeed they have such a fear of it that even if they found one, they would not fire, as they say if only wounded the whole pack turn upon the hunter and destroy him. In this there is doubtless much exaggeration, but nevertheless the idea, however erroneous, is sufficient to deter the shikarre from the chase. These dogs are also found in the forests of Chooara, where, hunting in packs, they destroy deer and other game; even the leopard and the bear are said to fly before them, and will not remain in the same jungles. They also attack the flocks, and commit great havoc. I heard of an instance where a shepherd lay in wait for their coming, armed with a matchlock, with which, from the shelter of his hut, he intended to shoot or scare them away from his fold, which they had on a former night attacked. Alas, however, for the weakness of human resolves, no sooner did the pack arrive than the shepherd's courage vanished, and like that of Bob Acres in the Rivals, fairly oozed out at the palms of his hands, and he was afraid to fire; for said he, very prudently, "Who knows if I only wound one but that they may pull down my house and attack me; no, no, let them eat their mutton in peace;" and so in truth they did, for the next morning the coward found twenty-five sheep killed and mangled by his midnight visitors. This animal is also said to exist in Chinese Tartary, and is called "Ch'ingkoo."

It is in the forests of these lower hills, that the various beautiful species of the pheasant tribe are found, and none but the Chikore and gigantic partridge are seen in the upper portions of Kunawur.

On the 28th of May I left Nachar and travelled for a mile or two over a capital road, descending to the Sutledge, which I crossed by the Wangtoo bridge. This although dignified with the name of a bridge, is in truth no more than a good broad sangho; it is constructed entirely of wood, and consists of three or more long trunks of trees thrown across the river, the ends resting on buttresses of stone masonry, and supported by three rows of projecting beams or slanting piles. On these buttresses stand two covered gateways through which the bridge is entered on from either side; across the trees, are nailed planks of wood, and the sides were formerly protected by a slight railing, though it has now almost entirely disappeared.

The space of the sangho is the breadth of the river, or eighty feet, and its height from the water, which I measured with a plummet, was fifty-seven feet.

In former years before the invasion of Kunawur by the Goorkhas, a good bridge existed here, but it was broken down by the inhabitants of the districts, to cut off the communication across the river and check the advance of the enemy. It was never afterwards rebuilt, until the time of Capt. Kennedy, when the present sangho was thrown across.

According to accounts received from the natives, the present bridge was built by them, and Captain Kennedy on the part of Government furnished the means, to the amount of two thousand rupees. Others say that it was built at the suggestion of Capt. P. Gerard, when stationed as commercial agent at Kotgurrh, with the view of facilitating the communication with Chinese Tartary and the upper portions of Kunawur, as the fleece of the Choomoortee sheep, called byangee wool, was then in demand, and purchased for the British Government.

The glen is at this point very narrow, and confined by the dark rocks of gneiss rising up abruptly on either side, and affording merely space sufficient for the bed of the river. Beneath the bridge the river rushes like a sluice, and has such a deafening roar that the voice of a person speaking on it is scarcely heard. From this, a short quarter of a mile brought us to the Wungur river, which runs down from the Kooloo side to join the Sutledge a little above the Wangtoo bridge; we crossed its stream by another sangho, and then addressed ourselves to climb the hill, which rose above us to the height of 2000 feet.

Up this ascent we toiled in a temperature of 98° over a road strewn thickly with the sharp cutting fragments of gneiss and granite, and wearied with the heat and fatigue of climbing in a midday sun. We felt vexed and disheartened on arriving at the top, to find that our labour had been all in vain, for on the opposite side of the hill the road again dipped down to the very edge of the Sutledge, while far away in the distance we could see a second long ascent to be travelled up ere we could find shelter and refreshment at the village of Churgong. The heat and length of this day's march were very painful, as the road often lay along the very brink of the river, the glare from whose waters was almost insufferable, which added to the fatigue of walking, or rather scrambling over the rocks and stones that were strewn along the banks, and the hoarse incessant roar of the foaming stream, completely fagged us all, and it was late in the evening ere my tent and baggage made their appearance.



Scarcely had we arrived at the end of the march, when to add to our discomfort a heavy thunder storm suddenly broke over us, obliging us to seek shelter where we could, and soaking my bed and other things which were still far in the rear. In the evening I witnessed one of the most beautiful rainbows I had ever beheld ; the sun was just dipping to the ridges of the hills, and shining on the vapoury clouds that were floating up the valley, caused the bright colours of the rainbow to stand forth most brilliantly, one end resting on the river's brink while the wide arch was thrown across the valley and was lost beyond the snow-clad summits of the other bank.

It was nearly opposite to this village, on the left bank of the Sutledge, that the conflict took place between the Goorkhas and Kunawurees, in which the advanced guard of the former experienced so warm a reception as to make them glad to come to terms, and a treaty was accordingly entered into, stipulating that so long as the Goorkhas refrained from entering Kunawur, a yearly tribute should be paid to them. This treaty, I believe, was never infringed, and remained in force until the expulsion of the Goorkhas from these hills by the British forces.

My people were so tired with the long march from Nachar, that they begged hard for a halt at this place : as I was anxious to push on however, and the next stage was said to be a short one, I did not comply with the request, and accordingly proceeded on the morrow to the village of Meeroo.

Nearly the whole way was up hill, and in some places steep and rugged, but it got better by degrees, until entering a forest of prickly leafed oaks it became very good and continued so, although still up hill, to the end of the march. The heat and consequent fatigue of climbing steep hills under a burning sun were almost intolerable, and I wished many a time that we were among the snows which capped the range along whose sides we were toiling. Few things are more calculated to strike the naturalist, in wandering through the grand and beautiful scenery of these stupendous hills, than the almost total absence of living creatures ; days and days he may travel on, through woods that seem to promise shelter for every various form, so diversified are the trees and plants which they produce ; yet, save the crow, or the swallow as it skims along the open grassy tracts, scarcely a living thing is met with ; all seem to shun the intermediate heights ; and while the bear and leopard, deer, and goats, flock to the higher ridges near the snow, the various species of the feathered race cling to the lower woody tracts, where sheltered and secure they rear their

young. At Meeroo the temple was adorned with about twenty pairs of horns of the sikeen and wild sheep; the former animal is an ibex, and is said to have been once plentiful here among the snows, but of late years it has entirely disappeared from the neighbourhood. Some of the horns on the temple are of large size and were placed there by the fathers and grandfathers of the present generation, none of whom recollect seeing the living animal near the village, although there are some old men among them too. I inquired if I might take some of the horns, to which they replied with feigned astonishment, "they are presented to Devi, and who will dare to rob her temple?" I disclaimed, of course, all intention of *robbing her*, but suggested that as she had now possessed the horns for some time, she might perhaps be willing to take something else *in exchange*! To this they said, she could have no objection; and after a little bye play among themselves, a hoary headed old sinner stepped forward and informed me that "the devil was willing to sell his horns at two rupees a pair!" I agreed to give it, but on examination it was found that the whole batch of them were worth nothing, being quite rotten and decayed from age and exposure to the elements, so I declined taking them. The wild sheep is still occasionally found on the heights above the village, and sometimes also a stray *jahgee*, or horned pheasant. I had made repeated inquiries regarding the actual existence of an unicorn in any part of the hills, but although I found many who had heard of such an animal, and believed in its existence, I could meet with no one who had ever seen it.

Here however I encountered an old man who had travelled much in the interior, and various parts of the mountains, and who declared that he had once beheld the unicorn. I was of course all attention, and on the tiptoe of delight with the idea that I should now have an opportunity of describing this long considered fabulous animal, and of ending discussion past, present, and future, as to its existence. Alas, my visions were doomed to fleet away, for after a long and close examination, in which it was necessary to listen to a rigmarole history of the old man's birth, parentage, and education, and his never ending travels into Tartary to purchase wool, which he had done regularly every summer of his life for forty years, it turned out to be nothing more than an ugly clumsy rhinoceros which he had seen in the possession of the Rajah of Gurwhal, and which he described as being like an elephant without a trunk, and having a horn on its nose.

From Meeroo we had an up hill march all the way, and crossed the first snow at a stream over which it formed an arch, so hard and solid

that it did not yield to the tread, though the sun at 10 A. M. was shining on it at a temperature of 82°, while the stream beneath was as low as 38°.

From this spot commenced a long ascent over the side of a grassy hill, strewn with sweet smelling violets and the little scarlet "pheasant's eye," and near the summit of which we encamped, being about three miles from Rogee, which is the usual stage, but being situated off the road at half a mile down the Khud, I preferred staying where I was for the night. From this place we had a good view of the Burrenda Pass which was indeed apparently only separated from us by the deep glen through which the Sutledge flows; it was still thickly covered with snow, and looked like a deep notch cut in the snowy range. The hill above our encampment was also heavily covered with snow, from which throughout the day, immense beds or avalanches, loosened by the heat of the sun, were constantly precipitated into the glen below, or falling from rock to rock with a heavy and deadened roar like distant thunder, and resembling in their course some mighty cataract. Towards evening as the sun dipped behind the range and the first chills of night were coming on, these sounds gradually died away, and the snow became once more bound up by frost. The height of my camp here was 9,897 feet, and the little lagoynys and the chough were now first seen among the rocks that overhung us; here too, I once more found the purple iris, discovered in my trip to the Burrenda pass, but it had not yet put forth a single bud. On the 31st of May I continued my march towards Chini, by a good road that continued to ascend for some distance, and at length brought us to an elevation where many beautiful plants of iris were in full bloom; it was the same as that found at my last encampment, and among them was a single root bearing a pure white flower, showing modestly among the deep purple of the neighbouring plants, like a fair bride surrounded by the gay and glad attire of the bridal train.

A little farther up the ascent, at about 10,500 feet, I took some splendid specimens of a new species of *peepa*, the largest of that genus I have yet seen belonging to our Presidency. They were adhering by a thin viscous plate to the stalk of a coarse grass, growing at the roots of juniper and a species of furze bush, the latter beautifully covered with yellow flowers. The species being new to science, I have given it the name of "*Peepa kunawurensis*," from the district in which I obtained it. Here too the rhubarb was growing abundantly, and as I had now tasted no vegetables for many days, I gathered some of the stalk and had an excellent stew for my dinner.

About three miles from Chini we came to a place where the whole hill-side had slipped away into the Sutledge, forming a mural precipice of several thousand feet from its base to the summit. The rock was thus a perpendicular cliff, and the road which leads along the face of it is a mere scaffolding, somewhat resembling that used by builders against the side of a house. Looking down from this exalted station the Sutledge is seen, narrowed by the distance to a stream, as it winds along below at the perpendicular depth of 4,000 feet. This though an awkward place to look at, and somewhat like walking in the gutter of a fourteen storied house in the "gude town o' auld Reekie," is nevertheless perfectly strong and safe, and almost capable of allowing two people to walk abreast, so that unless one wishes to look below into the yawning abyss, it may be passed over without having been once seen. That it is safe, may be gathered from the fact that flocks of sheep and goats laden with attah and grain, pass over it almost daily during the summer months, as also men ; in fact it is the high road in every sense of the term between Rampore and Tartary.

Much has been said and written concerning the dangers of the way, but the road, taking it on an *average*, has hitherto been *excellent*, and though here and there, from stress of weather, it is at times a little broken and perilous, yet those places are so few, and continue for such short distances, that they cannot be allowed to characterise it, or to admit of its being called dangerous or even bad.

True enough it is, that one of these bad places may be the means of breaking a man's neck if he chance to slip, but the answer to that is, that he who cannot keep his feet, or who grows giddy at the sight of the depths below, has no business to travel over "bank and brae." The road is kept in repair by the zemindars of villages, by order of the Rajah, and much credit is, I think, due to them for the manner in which they perform the task ; for with very little additional care to that which is now bestowed upon it, it might vie with any of those of the lower hills, and is even now superior to them in many parts.

There is no spot, in fact, even the worst, which a man ought to turn away from, and though I would not recommend a lady to try them, I can safely say, that I have crossed many a worse place in the khuds near Simla, while in search of objects of natural history. But after all, the difficulties of a road will be always estimated according to the imagination or temperament of the traveller ; for he who is accustomed to mountain scenes, or to scramble over all places as they may occur, will laugh at that from which another man would turn away ; habit is a great thing even here, and that which seems

dangerous at first, becomes nothing when one is accustomed to it. Thus it may happen that others shall follow in my path and laugh at that which I have called bad or dangerous.

The scenery from Meeroo to Chini is beautifully grand and imposing, the snowy range on the left bank being spread along the whole way like a fair white sheet, and raising its ragged outline far above all vegetation, till it attains, as in the bold giant peaks of the Ruldung group overhanging Chini, an elevation of twenty-two thousand feet above the sea.

The right bank of the river presents a marked contrast to this bold and awful grandeur, the hills receding more gradually and with a less shattered look, being thickly clothed to their very summits with noble forests of pines of many species, as the Kayloo, Neoza, Spun, and Cheel.

Chini, though a tolerable sized village for the hills, has a poor and ruinous appearance about it ; it is situated in the midst of cultivation which is plentifully irrigated by streams from the snows above, which come dashing down in a sheet of foam as white as the snow beds from which they issue. Chini is rather the name applied to several small villages or hamlets scattered among the cultivation and resting on the slope of the right bank, than that of any one in particular. This is not uncommon in Kunawur, and occurs also at the next stage, where several are again comprehended under the one name of Punggee.

On the opposite side of the Sutledge, a few miles higher up its course than Chini, is situated the village of Pooaree, famous for producing the best kismish raisins in Kunawur. It is also the residence of one of the vuzeers, and has a *joola* of *yák's* hair ropes over the river from which a road leads up to the Burrenda pass.

On the 1st June I proceeded to Punggee, where a number of my coolies whom I had brought from Simla became alarmed at the accounts they heard people give of the scarcity and dearness of provisions in Spiti, and refused to accompany me farther. Remonstrance and advice were alike thrown away upon them, and finding that neither promises nor threats had any effect, I gave the order to the Churriah to furnish me with the necessary number. On his announcing my order to them in the Kunawur language, a most amusing scene took place ; men and women, old and young, threw themselves at once with such hearty good will upon my baggage, each scrambling for a load, that I fully expected to see half the things torn to pieces in the scuffle. After much noise and laughter each succeeded in obtaining something, and off they all trudged right merrily towards

Rarung with their burdens, joking to each other as they passed the astonished mutineers, who little expected to see me thus far from home so speedily supplied with carriage. In fact they had somewhat reckoned without their host, and thought that as I was so far advanced into the hills, they might safely dictate the terms on which they wished to be retained. Five of the number afterwards repented and followed me to the next stage, begging to be reinstated, which I granted, but fourteen others went back sulkily to Simla.

In Kunawur the women often carry quite as much as the men, and several of them marched along with apparent ease under burdens which the effeminate Simla coolies pronounced to be too heavy. One fine stout Kunawuree, whipped up in the scramble four bags of shot, amounting in weight to 56 seers, or 112 lbs, and carried them on his back the whole march, which is hilly and over the worst bye paths I ever saw, even in the hills. Two men had previously brought these same bags from Simla, and grumbled at the weight which was allotted to them, namely 28 seers each. The hardy Kunawuree demanded only two annas for his work, while the Simla men had refused to carry half the weight for three annas a day. While on this subject it may not be amiss to inquire why, since throughout Kunawur and all the neighbouring districts, the coolie demands but two annas per diem for his labour, those of Simla are allowed to refuse to take less than three? For two months and a half I had occasion to hire daily a number of these men at every stage; not one ever dreamed of asking more than a paolee, or two annas, nor was there hesitation and grumbling in lifting their allotted loads; each took his burden on his back and trudged merrily along with it to his journey's end. On returning to Kotgurh not a man would move under three annas, and all objected that the loads were too heavy, although the same had often been carried for long and fatiguing stages by the women of Kunawur. The weight allotted to each coolie is, by order, not to exceed thirty seers, but when was a coolie hired within the British rule, who did not hesitate and often refuse to carry twenty seers? They will come and lift the load, pronounce it too heavy, and walk off, and as far as I know, there is no redress for it, or at least I never heard of any one getting it. It is childish to fix a load at thirty seers and yet leave the coolies at liberty to reject half the weight if it so please them. The Kunawur coolie carries more, carries quicker, and demands less for his labour, than those within our rule; with whom the fault may lay, I do not presume to say, but it seems to me that a remedy for the evil might easily be found, by an order from

those in authority regulating the fare of a coolie to be two annas a day, marching or halting, and that any man plying as a coolie and refusing to lift a load not exceeding the regulated weight, shall be subject to punishment, or be turned out of the bazar, and not allowed to ply again. For the purpose of seeing these orders carried into effect, a coolie mate or police Chupprasee could be appointed from out of the many idle hangers on, of the Political Agent, and the coolies might be ticketed or licensed to ply. From Simla to Bhar, which is in reality but three marches, a greater imposition still exists, for no coolies will go either up or down under twelve annas, which is at the rate of four annas a day, and often the demand, when Simla is filling or people are returning to the plains, is one and even two rupees. In former days things were much better managed, for there are those still living in the hills who remember a coolie's hire to have been two annas marching, and one and a half halting. Now, however, every coolie talks of non-interference, and the rights of a British subject ! and threatens you with his vakeel and a lawsuit, and many other combustibles besides.

There is perhaps no bazar in India where the European is more at the mercy of the native than in that of Simla, for there exists no Nerick of any kind, and I have heard it maintained by those in authority, " that a man may demand what he pleases for his labour or his goods ;" which is in other words to say, that the native may be as exorbitant as he pleases, and the European must pay the piper !

No one can more warmly advocate the strict administration of justice between man and man, than I do, whatever be his colour, whatever be his situation in life ; but it appears to me by no means either just or necessary to uphold the native on all occasions, or to consider the European as always in fault. Such a system tends materially to lower the dignity of the British character without in the least increasing the popularity of him who adopts it, for the shrewd native is ever willing to join with the European in the cry, " 'Tis a very bad bird that befouls its own nest !"

But to return,—" The high road across the ghats from Punggee to Leepee being impassable from the depth of snow in which it was buried, I was obliged to change my route and proceed by a lower and more circuitous road to Rarung. On leaving the main road, we followed a byepath which dipped so suddenly and abruptly down the glen that it was with the greatest difficulty we could keep from sliding down the slope, so slippery was the ground from moisture and from the pine leaves strewed around. In some places indeed a single false step, or a

fall on the back, would have sent the unfortunate flying down into the foaming torrent below, at a rate as rapid as that of a slider on a "Russian mountain." We managed however, with much care and fatigue, to get slowly and safely to the bottom, where we crossed the river (which was furnished by the snows above) on a broken sangho, formed merely of four spars laid close together, and rendered slippery by the spray which was continually dashing over it. From this we again ascended by a road not many shades better than the one by which we had just come down, and it continued thus the whole way to Rarung.

We had also to cross many smaller snow streams, which being without sangho or stepping stones, obliged us *volens volens* to walk through them, sometimes nearly up to the knee in water, at a temperature of 38°, or only 6 degrees above the freezing point! It was indeed anything but agreeable, for we felt as if our legs were being cut off, and I vowed *coute qui coute* to cross the ghats on my return, whether they were blocked with snow or not. The forest all along this march was composed of Kayloo and Neoza pines. These names are only applied by the inhabitants of the lower hills and plains, the trees being known in Kunawur as the "Kelmung," and the "Kee," and the fruit or edible seed of the latter is alone called "Neoza."

From Rarung we had rather a better road than yesterday, but still bad, being chiefly over sharp blocks of granite and gneiss. This day we encamped at Jung-gee, and again proceeded on the morning of the 4th of June towards Leepee. The hills on the road from Punggee to Leepee have a shattered and decomposing aspect, vast masses being annually brought down by the action of the frost and snow, leaving in some parts high mural cliffs rising perpendicularly above the path to eight hundred and a thousand feet, while at their base is stretched a wide field of disjointed fragments of every size mixed up with beds of sand, decomposing mica slates, and felspar. These slope more or less gradually down to the river's edge, often at two and three thousand feet lower than the base of the cliffs. If a snow stream happens to descend near these accumulations, its waters are turned upon them by artificial drains, and in a few short months the former barren waste is seen to smile with young vineyards and rich crops of barley. But if, on the other hand, as too often happens, there is no stream near, the sands are left barren and dry along the river's course, sometimes increasing from fresh supplies from above, at others partially swept away by the force of the river when swollen by the melting snows in June and July. In the descent of these falling masses



whole acres are sometimes ploughed up, and the trees of the forest are crushed or uprooted by the rocky avalanche, more completely than if the axe had cleared the way for cultivation. This devastation is chiefly caused by the alternations of heat and frost ;—the power of the sun during the day acting on the beds of snow, causes innumerable streams to percolate through the cracks and crevices of the rocks and earth, which being frozen again during the frosts of night, cause by expansion the splitting of the granite into blocks, which being loosened by the heat of the following day from the earth which had tended to support them, come thundering down with fearful rapidity and irresistible weight through the forests which clothe the mountain's sides. After proceeding somewhat more than half way to Leepee, my guide, whose thoughts were " wool gathering," very wisely took the wrong road, and led me down a steep glen, at the bottom of which had once been a sangho across the stream, and the road from it was a somewhat nearer route to Leepee ; but alas ! when we arrived at the bottom the torrent had washed away the bridge, and although we might have forded the stream, we learned from some shepherds that it would be labour lost, as the road up the opposite side of the glen had given way and followed the bridge down the stream, so that it was impassable. In this dilemma we had nothing left for it, but to reascend on the side we were on, and the shepherds gave us some comfort, by saying we need only climb up a little way, when we should find a path. To work we went accordingly, setting our faces to the hill with a willingness that did not last very long, for we found that the short way of a Kunawurree was something like the " mile and a bittock" of bonnie old Scotland, " aye the langer, the farther we went."

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This was truly the steepest hill-side I had ever encountered. Without the vestige of a path or any track, up we toiled, now grasping by the rock, and now by the roots of shrubs or tufts of grass, until at last it got so bad that we could scarcely proceed at all, partly owing to the steepness, and partly to the slippery nature of the pine leaves which thickly covered the soil. At several places the first up was obliged to let down a rope or a part of his dress to assist the others up. After a time, however, as we approached the top of the hill, and when well nigh exhausted with fatigue and heat, the ascent became more easy, and at last we debouched from the forest of pines upon a large open, swampy tract, immediately below the snows, which supplied water for a hundred rills, studded with a small yellow flowered *ranunculus* that I have some recollection of having seen in

similar situations in Europe. There were here many plants familiar to me, as the strawberry, the little pheasant's eye, the mare's tail, and a plant in search of which many of us in our boyish days have wandered through the fields of old England, in order to feed our rabbits, it is known, if I forget not, by the name of "queen of the meadows," or "meadow sweet," and grows abundantly, as it does here, by the side of ditches and brooks. The currant, wild rose, and dwarf willow were plentiful also, especially the latter, for which the swampy nature of the ground was particularly genial and adapted. Here we at length found the path for which we had so long toiled in vain, and now when found, as often elsewhere happens, it was not worth the trouble it had cost, being but a mere sheep track along the side of a decomposing and crumbling hill, where the footing was as insecure as well could be, and where the prospect below was inevitable death to the unfortunate who should misplace his foot or lose his balance. Time and care however took us safely to Leepee, where I was right glad to find my tent pitched; and as the Himalayan ibex or sikeen was said to be found in the neighbourhood, I determined to make it an excuse for halting a day or two. This measure had moreover become somewhat necessary, for the toil and fatigue of climbing over such broken and rugged paths as we had travelled for the last three or four days, in the heat of the noonday sun, when the thermometer generally indicated a temperature exceeding 95°, had brought on so severe a pain in my right side, that often I found it absolutely necessary to lie down for awhile on the ground, until it had somewhat abated. This, added to a severe cold, caught from the necessity we were sometimes under, of wading when profusely heated with walking, nearly knee-deep through several streams, whose waters having only recently left the beds of snow above, caused the thermometer to stand at the cooling temperature of 38°, made it necessary that I should take a rest, and while doing so, I determined to dispatch men into the upper glens in search of the long wished for ibex.

On arriving at my tent I made immediate inquiries for sportsmen, or shikarrees, and heard to my dismay that the only man in the place who knew how to handle a gun, had gone "away to the mountain's brow," to sow phuppra seed for the autumn crop. Seeing my disappointment at this unexpected piece of bad news, a little dirty, half-clad urchin offered to start off to the shikarree and tell him that a "Sahib" had arrived, which news would of itself be sufficient to bring him down. I asked how far he had to go, and when he would be back? to which he replied, "It is eight miles going and coming, but

we'll be here by sunset! At this time it was one o'clock in the day, and the first four miles were up a hill that appeared in the distance to be almost inaccessible to anything but the ibex itself, yet the hardy little mountaineer was true to his word, and returned before sunset with his friend the hunter. He was a black-faced, short, square-built fellow, with scarcely any perceptible eyes, so shaded were they by his bushy projecting eyebrows, and high cheek bones. He was well clad in woollen clothes, and round his waist was fastened a brass chain, from which was suspended a steel, a powder flask, and a long sharp knife. He was a hardy looking fellow, and from his frank and easy manner evidently one who could boldly look danger in the face, and who knew how to meet it like a man. He was as keen and anxious for a brush with the ibex, as I was to obtain one, so that powder and balls being furnished, he declared his readiness to start by break of day. As to my attempting to go with him, he laughed outright at the idea, and said at once, unless I staid where I was, he would not go, for I should infallibly break my neck, and spoil his sport into the bargain.

The chase of these animals is one often attended with great danger, from the inaccessible nature of the cliffs among which they love to roam, and there are few who are hardy enough to follow it. Often the hunter is obliged to crawl on his hands and knees along some ledge of rock projecting over a glen or chasm of several thousand feet in depth, and from such a spot laying on his belly, snake-like, he draws himself along, takes aim, and fires on the unsuspecting herd. If the shot be successful, it is still a matter of much difficulty and danger to procure the quarry, from the steepness of the rocks among which it lies, and too often the last struggle of departing life causes it, when almost within the hunter's grasp, to slip off the ledge, and fall headlong with thundering crash down into the yawning gulph, a prey to the vulture and the crow. These animals are sought for chiefly for their skins, which are either sold or made into shoes, &c. and the horns are presented as an acceptable offering to the deity, and nailed upon the walls of the temples.

Matters being soon arranged, my sturdy friend departed to the hunting ground, accompanied by a shikarree whom I had brought with me from Kotgurh, promising to do his best, but saying that most likely he would get nothing, as the summer season coming on, caused the animals to retire to the last ridges of the mountains, where no man could follow them.

About sunset on the following day, my own shikarree returned

with a long and rueful countenance, and announced the unsuccessful termination of the day's sport. They had found a small herd, chiefly of females, and had each a shot, but with no other effect than that of scaring away the game, and nearly throwing the Leepee hunter over the cliff, for the English powder I had given him caused his match-lock to recoil so violently, that both were nearly taking flight to the depths below. On inquiring for my flat-faced friend, it appeared that he was ashamed to face me again empty handed, and therefore had stopped on the hill-side for the night, at a shepherd's hut, from whence in the morning he could easily repair to his sowing in the heights. I sent him next day a large clasp knife, with a message to be ready for me on my return, when I would give him a chance of retrieving his character as a shot. His son, who undertook to deliver the knife, seemed highly delighted with the present, and declared that I should have a specimen of the sikeen on my return, but alas, as will be seen hereafter, these promises were fated to be broken.

On the 6th of June I resumed my journey, somewhat recruited by the day's rest I had enjoyed, and proceeded by a steep ghat to Labrung and Khanum. Descending to these places from the summit of the pass, the road lay through a scattered forest of Neoza and Kayloo pines, intermingled here and there with the cedar of Kunawur, the first specimen of which we saw at Leepee. It appears to be a species of juniper, and sometimes attains a goodly size, though generally it is dwarfish, and crooked in the extreme. The names by which it is known in Kunawur and Hungrung are "Lewr," and "Shoor;" its wood is esteemed as incense, and offered by the Lamas to their gods. Small quantities of it are also burned to charcoal and used in the manufacture of gunpowder. The planks obtained from it are used in the construction of temples, and they are sometimes also in demand at Simla, to make boxes with. Scattered over the more open parts, were beds of juniper and tilloo (also a species of cedar used as incense) and the yellow flowering furze already seen near Chini.

After an easy march we encamped at Labrung, a small and filthy looking place, built on the edge of a shelving hill. The town of Khanum is of goodly size, and stands opposite to Labrung, the two places being merely separated by a narrow glen. In this town many Lamas reside, but at the time of my arrival the principal of them had gone to Simla in the train of the Rajah, or in other words, "the chief had put his tail on," and their presence was required to form part of it.

The season here appeared to be far behind those of the lower parts of the district, the barley being yet green and far from ripe, while

below it had long been reaped and housed. Khanum is said to produce the best sooklat, or woollen cloth, of any town in Kunawur; it is made chiefly of the byangee wool, or fleece of the Choomontee sheep, in Chinese Tartary.

From Labrung there are two roads to Soongnum, the next stage, one lying along the base of the hills, which is very bad, and merely a bye path; the other crossing the Koonung pass, which although quite practicable, was represented as being still deeply buried in snow. My people however declined attempting the heights, and preferred taking the lower road, so I started alone with the Churriah and a guide across the mountain path.

The ascent is long and steep, as may be gathered from its crest being 5,212 feet higher than our last encampment; it is however far from difficult, and the road is excellent, but unfortunately at this season we saw nothing of it above 13,000 feet, as it lay buried in the snows, which were spread in a broad white sheet over the whole range. Following the traces of a flock of sheep which some days previously had crossed the pass, we managed to do well enough without the road.

From Labrung we first ascended through a forest of Kayloo and Neoza pines, beneath which were spread vast beds of junipers and furze, with here and there a few fine currant and gooseberry bushes loaded with small green fruit, but as yet far from ripe. Farther up, these beds of junipers increased, and were intermingled with another species growing more like a bush, and the same as is known at Leepce by the name of Tilloo.

Gradually as we mounted up the hill, the pines decreased in numbers and in size, dwindling at length to dwarfish shrubs and ceasing altogether at about 12,500 feet of elevation. Here first began the snow, lying in large fields or patches, and uniting at about 13,000 feet into one broad unbroken sheet, from whence to the summit of the pass, or 1,500 feet more, it continued so. The depth generally was not great, though in some places up to the middle or even higher; where it had drifted or had been hurled down in avalanches from above, of course the depth far exceeded the stature of a man.

The only danger in crossing these fields of snow at this season, when the thaws commence, is for loaded people, for if they fall in deep or broken snow, they run a risk of either being smothered beneath the weight of their burdens, or of losing the things they carry. The fatigue however, even to us without any loads at all, was great and distressing, owing to the steepness of the latter part of the way, for the path which winds gradually to the crest being lost to sight, we were

obliged to steer for the top of the pass by a direct line upwards, and the uncertain footing we obtained in the snow, which constantly gave way beneath our feet, caused us to slide backwards down the hill for many yards before we could stop ourselves again. The sheep track too, which had hitherto been our guide, at last failed us, and we journeyed on by guess; we had however the whole day before us, and a bright unclouded sky, so it signified little how long we took in ascending.

About 800 feet from the crest of the pass, I observed in the snow the prints of feet, which at first I thought were those of a man, but the deep holes made by long claws at last arresting my attention, I found on a closer inspection that they were the traces of a bear. Well knowing that in dangerous places the instinct of a brute will often lead him safely through difficulties where man with all his knowledge would fail, I hailed these traces as an assurance of our safety, and at once unhesitatingly committed myself to bruin's guidance; nor was I wrong, for following his footsteps, they gradually led me beyond the snow, and were lost.

The crest of the ridge was uncovered for about 50 feet on the southern slope, and here we again found the road, which was visible just long enough to assure us that we were in the right direction for Soongnum, and then again disappeared beneath the snows on the northern side. I have often been told by shikarrees that there are two species of bears in the hills, a black one which feeds on fruits and grain, and which is the common Thibet species, (*Ursus Thibetanus*) and another of a reddish sandy colour, which is only seen on the confines of the snow; this species is said to feed on flesh. It is curious that the traces of the bear on Koonung pass should have been exactly on the line of direction taken by the flock, whose dung being scattered occasionally on the snow shewed that they too had gone the way that we afterwards by bruin's direction followed. It would seem at least to give some colour to the assurance that this bear lives upon flesh, for from the foot of the pass on either side, that is, from 12,500 feet to its crest, which is 14,508 feet above the sea, there was not a blade of grass perceptible, and only here and there, where the snows melted or slipped away, were a few plants of a species of "*Potentilla*" beginning to show themselves. If then this bear lived upon vegetables, he had nothing here but the junipers and furze. It could scarcely be possible that he had scented the grain with which the sheep were laden. The Churriah who accompanied me from Rampore, and who lives near Nachar and Tranda in Kunawur, declared that the two bears were of the same species, and that both lived on flesh as well as vegetables,

often attacking the flocks and even cows during the severity of winter, and that he himself possessing flocks, knew it to his cost. In this case it is most probable that the animal had left the forest below the pass, and traced the sheep by the scent they had left on the snow.

On gaining the summit of the pass, the thermometer only indicated a temperature of 45° at 10 A. M., and a cold keen wind was blowing from the southward. From this elevated spot we looked back over the snow-clad mountains, beneath whose summits or along whose sides we had for several days been travelling.

Viewed from this height they appeared to be nearly on a level with ourselves, and wearing a look of cold and dreary solitude, which gave a sternness to the scene not altogether pleasing to behold, as one could not help experiencing a feeling of loneliness and melancholy at the thought of losing the way, or being benighted on their hoary summits. Rising conspicuously above the rest were seen the mighty Kuldun peaks, presenting in the glare of noon a dazzling whiteness that pained the eye to view; beneath this group we had encamped at Chini.

"Far as the eye could reach, or thought could roam," all was one broad unvarying waste of snowy peaks, unbroken by a single shrub or tree, except in the depths of the darkly wooded glen, which stretched along the bottom of the pass where we were standing. Not a sound nor a rustle even caught the ear, save the rushing of the keen wind that was drifting the snow in wreath or spray before it; not a living thing was seen to stir amidst this wild and majestic scenery. All was so calm and still that it chilled one to behold it, and but for the ragged and shattered peaks around, which told of the fearful warring of the elements upon their crests, the traveller might almost suppose that the elevation had carried him beyond the strife of storms, to which this lower world is subject. It is amidst scenes like these, where words cannot be found adequately to describe the grandeur and magnificence that every where delight the eye, that man is led involuntarily to acknowledge his own comparative weakness and insignificance, and as he views the stern cold majesty of the wintry and never fading waste of snows by which he is surrounded, spite of himself his thoughts revert to Him, the impress of whose mighty hand pervades the scene, and by whose merciful care alone, he is guided safe through countless and undreamed of dangers.

From the crest of this pass, looking north-easterly, we beheld far below us, at the depth of 5,000 feet, the town of Soongnum, to attain to which we had still before us a tolerable day's journey. On making

some remark on the length of the route from Labrung to Soongnum, the guide now for the first time informed me that it was usually made in two marches, but fearing that I should feel it cold if I slept a night on the pass, he had not told me so before, lest I should have halted there. Tired with the ascent, and the toil of climbing over the slippery snow, I did not feel the least grateful to him for his consideration, which I plainly saw was more on his own account than on mine; however, as revenge is sweet, I had some consolation in the thought that he had eaten nothing that day, while I had already breakfasted, and that he would consequently be preciously hungry before he reached Soongnum. However, there was now no help for it, for the baggage had gone by a different road, so onwards and downwards we must go.

From the spot where we stood, to fully two miles and a half below us, was spread one pure unbroken sheet of driven snow; beyond this for half a mile more it was broken and lying in detached masses. No vestige of a road was seen of course, until far below where the snow had ceased. There was however no danger, although the descent was somewhat steep; and the guide setting the example, we seated ourselves on the snow, gave a slight impetus at starting to set us in motion, and away we went on the wings of the wind, at a rate which seemed to the inexperienced to argue certain destruction. I had not gone very far, when I began to feel my seat rather *moist* and *chilly* from the melting of the snow, and by no means pleasant to the feeling, so I dug my heels well in, and brought myself to a stand still. Another of the party wishing to follow my example, and not sticking his heels firm enough into the snow, toppled over from the rapidity with which he was descending, and rolled away heels over head a considerable way down the hill, amidst the shouts of laughter, which we sent after him. He got up as white as a miller, with his eyes, mouth, and ears, crammed full of snow, and affording a capital representation of "Jack Frost."

Walking, although requiring some care to keep myself from falling, was far preferable to the chilly seat; and after sundry slips and slides, I succeeded, much to my satisfaction, in reaching a spot where the snow had melted away. But my situation after all was not much mended, for the cutting wind that was blowing from the pass, soon converted my moistened inexpressibles into a cake of ice, which was infinitely worse than the melting snow, and my legs and feet soon became so benumbed by the cold, that it was painful to move at all. Seating myself once more, by direction of the guide, I took off



my shoes and socks, and proceeded with a handful of snow to rub my feet and ankles, which although somewhat painful at first, soon restored them to a healthy glow, and then by jumping and fast walking backwards and forwards, I was enabled shortly to start again, and proceeded downwards by a path infinitely more dangerous than the snows we had just quitted.

Junipers and furze were the only signs of vegetation until we again entered a thin forest of pines lower down, through which we continued to descend until we crossed the Kushkolung river below by a capital sangho, and soon after arrived at Soongnum fairly gaged.

The fatigue of this double march may be readily conceived by those who have scaled the rugged sides of the hoary headed Ben Nevis of our fatherland; the height of that mountain above the sea does not exceed that of Subathoo in the lower hills, or about 4,200 feet, and its ascent and descent, if I recollect aright, occupies from  $3\frac{1}{2}$  to 4 hours. Here we ascended from Labrung to the height of 5,212 feet, over snows which were incessantly giving way beneath the feet, and causing us to slip backward many paces, added to which was the glare from the sun, which tended not a little to increase our fatigue and discomfort. From the summit of the pass our descent was 5,168 feet in perpendicular height, but the sinuosities of the road made the actual distance travelled from Labrung to Soongnum at least 15 miles.

When we recollect also that from the snow to Soongnum we travelled in a temperature of nearly  $90^{\circ}$ , the fatigue of the whole march can scarcely be conceived by those who have not experienced it. Our ascent and descent each exceeded that of Ben Nevis by one thousand feet, and there are few who have performed that journey who were not right glad to get a rest and a bit of fresh salmon, (to say nothing of the whisky toddy) at the snug little inn at Fort William. We left Labrung at six o'clock in the morning; at 10 A. M. we reached the pass; from thence to the bottom of the snow occupied us till noon, when the thermometer indicated  $89^{\circ}$ , and from thence we arrived at Soongnum at half-past 2 P. M., making the whole time from Labrung to Soongnum, eight hours and a half; or allowing at least two hours for resting and looking at the scene, we performed the actual distance in six hours and a half.

The coolies who had gone round by a lower and somewhat longer road did not arrive until 5 P. M., when they begged for a halt the next day, which I readily granted, as much on my own account as theirs, for the nature of the road from the snow to Soongnum was as if all the sharpest stones in the country had been collected there,

by which not only were my shoes cut to pieces, but my feet blistered and swollen also.

On entering the town of Soongnum I was met by a son of the vuzeer, who welcomed me with a plate of raisins, and escorted me to a small bungalow of one room, built long ago by a Dr. Wilson. Shortly afterwards the vuzeer himself paid me a visit, and proved to be no less a person than the frank and honest Puttee Ram, the friend of Dr. Gerard, and the source from whence he derived much of his information regarding the higher portions of the hills towards Ladak and Chinese Tartary. He has only lately been raised to his present rank. Time has not slept with him, nor failed to produce upon his hardy and once active frame its usual effects. He is now grey and bent with age, and his sons have succeeded him in their trade with the people of Choomontee and Ladak. The old man entered at once into a history of his acquaintance with Dr. Gerard and Mr. Fraser, and talked with pride over the dangers he had encountered with the former in their rambles through Spiti and its neighbourhood. He asked me if I had ever heard his name before, and the old man's eyes actually sparkled with delight, when pointing to an account of one of Gerard's trips, I told him his name was printed there. He has not only been a great traveller through the upper hills, but has also visited Kurnal, Delhi, Hansi, and Hardwar, though like all true mountaineers he sighed for home, and saw no place in all his travels to equal his own rugged hills; and truly I commend him for his choice. He is a tall, strongly built, broad shouldered fellow, but hideously ugly, his eyelids being large and sticking out over his eyeballs like cups, beneath which his eyes are scarcely visible. He has indeed, a face as like a *mastiff's* as I ever saw one.

From him I obtained a man who understood the Tartar language, to accompany me through Spiti, and he assured me I should experience no difficulties, as there was now a road across some parts of the mountains where, as in the days when Gerard first visited those parts, there was none at all. He informed me also that the lake called Chum-mor-rareel was only four days' journey from Dunkur in Spiti, so I determined if possible to get a peep at it. On inquiring for fossils, he said that Spiti produced but few; chiefly ammonites (*Salick ram*) which were found near Dunkur, but that the best place to procure them was on the Gungtang pass, near Bekhur, but the Chinese were so jealous of strangers looking at their country, that if I went there I should not be allowed to bring any thing away. Besides this, the pass was at the present season impassable, and from the lateness and

quantity of the snow which had fallen, it could not be open before the middle of August. . Hearing that the ibex was found at Koopa and at Poo,ee, in the neighbourhood of Soongnum, I again distributed powder and balls, and sent people to hunt them, telling them to have some ready by the time of my return. I made also some inquiries regarding the "excellent limestone" which Gerard says he discovered in this neighbourhood, and which the natives told him they should henceforth use in the construction of their buildings.

Puttee Ram said he recollected the circumstance I alluded to, but added that Gerard *had failed* in his attempts to convert the stone into lime. He had brought some fragments of it from the Hungrung pass behind Soongnum, and having made a small kiln, he burned the stone, but instead of producing lime it melted down into a hard slag. The experiment failed, and it has never been attempted since. At Soongnum during the winter months, the weather is sometimes very severe, the whole of the surrounding hills being enveloped in one white sheet of snow, often to the depth of several feet. The town, standing at an elevation of 9,350 feet, is completely buried during heavy falls. At such times the inhabitants assist each other in clearing their roofs from the weight of snow, which not unfrequently yield to the pressure, and are converted into a heap of ruins. To guard against the rigours of such a climate, is therefore the business of the summer months, at which season, accordingly, houses are stored with fuel and grass, and the leaves of trees are accumulated for the sheep and cattle, which are safely housed till the severity of the winter has passed away. At this season there is little, often no, communication between village and village, the inhabitants contenting themselves with clearing a track from house to house in their own villages, but not venturing beyond. This does not last, however, throughout the winter, but frequent thaws take place, succeeded by fresh falls of snow.

This description is generally applicable to all places in Kunawur, and the Churriah who accompanied me said he recollected three different years in which the snow had fallen ten feet deep, even so low down as Tranda and Nachar. At Simla, in the winter of 1835-36, the snow is said to have been upwards of five feet, and I myself saw on the 10th May, 1836, some of it still lying on the northern side of Jacko, on which Simla is built.

On the 9th of June I left Soongnum, and proceeded towards the first Tartar village of Hungo, by the Hungrung pass, which rises up behind Soongnum to the height of 14,837 feet above the sea. The road

led us up a glen by the side of a stream which had its origin as usual among the snows on the pass. The ascent although greater than that from Labrung to the Koonung ghat, was more gradual, and consequently much easier; nor had we so much snow to climb over, as at the former pass. The bushes in this glen, (for trees had ceased to grow) consisted of a great number of rose, currant, and gooseberry bushes, which yielded as we ascended higher on the mountain's side to furze and junipers. Towards the summit of the pass these were so thickly spread around, and the hill had such a gradual slope, that substituting furze for heather, the scene had much of the appearance of a Highland Muir, nor was this resemblance at all lessened when with a loud whistle up sprung before us from the covert some beautiful large partridges, whose plumage is very like that of the ptarmigan in its summer dress, being a mottled mixture of white and grey minutely pencilled on the back. These birds are known in the language of Kunawur by the name of "Bhair." They are found in abundance near the snows among the covers of furze and juniper, retiring as the season advances to the extreme heights of the mountains. They delight to perch upon some high projecting crag, from whence, surveying the country below, they send forth at intervals a loud and peculiar whistle.

On the crest of the pass, which we reached at half past 10 A. M., the wind was piercingly cold, and quite benumbed our fingers, the thermometer again standing, as at Koonung, at 45°.

The view from this spot was dreary enough; the town of Soongnum was lost sight of behind an elbow of the range, and on either side therefore nothing but cold bare hills were to be seen; neither village, cultivation, nor trees appeared to break the chilling waste of snows which spread around and far below us over every mountain's side; no signs of vegetation were to be seen, save the brown and withered looking furze, which even at this advanced season of the year had scarce put forth a single leaf.

The summit of this mountain is, as Gerard has truly stated, composed of limestone; but the reason of his failing to convert it into lime for economical purposes was apparent enough. The rock is one of those secondary limestones which contain large portions of clay and sand unequally distributed through them, sometimes occurring in detached nodules, at others disseminated through the whole. These limestones therefore from containing this foreign matter, refuse to burn into lime, but usually form a hardened slag, or vitrified mass within the kiln, which exactly corresponds with

the account given me by Puttee Ram of the results of Gerard's experiments.

Our path now again lay buried deep beneath the snows which were spread on the northern face in a sheet from the crest of the hills to many hundred yards below us. Here too, although it was both deeper and extending farther down than on Koonung pass, the gradual descent of the mountain's side made it far less fatiguing to walk over. We left the pass at eleven o'clock, and though we ran at a good jog-trot sort of a pace down the hill, it took us nearly three quarters of an hour by the watch ere we had cleared the first unbroken field of snow. Beyond this it was lying in patches, and here and there quite sloppy, so that my shoes, stockings, and half way up my legs were wetted through in a few minutes; lower down still, the water was running in deep streams from the snow, and as the track which had been dignified with the name of a road, was somewhat hollowed out on the mountain's side by the action of the feet of sheep and men, it of course formed a capital aqueduct, and accordingly a pure crystal stream ran along it, in which we were obliged to walk ankle deep (for there was no other safe footing to be had) for a couple of miles nearly, the temperature of the water being 43°, while that of the sun was burning over our heads at 90°. After about three hours walking and sliding by turns, we reached Hungo, a miserable ruinous village situated in a dreary glen at the foot of the pass, on a large and nearly flat tract of well cultivated land, at an elevation of 11,413 feet, and about 3,624 feet below the crest of the Hungrung pass. The snow was lying in a solid mass from the top of one of the glens arising from near the summit of the surrounding heights, down to within 150 feet of Hungo. This is however a most unusual occurrence at this season of the year, the snows having generally all disappeared from these heights by the beginning or middle of May, excepting in some of the deep recesses and ravines at the very summit of the range. Not a tree was to be seen, even at this elevation, except a few sickly looking poplars on the banks of a stream below the village, all of which had been planted there by the hand of man. The hills rising immediately behind this village are not however bare and barren, but are well covered with the furze already mentioned, which was just beginning to put forth its beautiful yellow flowers. Along with it was another species which until to day we had not noticed; it is smaller than the other, bears the same yellow flower, and extends to a much greater elevation; both are called "*Tama*," but the last mentioned is distinguished as "*Cheenka Tama*" or Chinese furze. The other species is termed by Gerard

"Tartaric furze," but the name is scarcely appropriate, since the plant is equally abundant over the higher hills of Kunawur, as on those of Tartary; and from the extensive range it takes, the name of "Himalayan furze" would suit it better. Besides which the species most common to the heights of Tartary is that known to the natives as the "Chinese furze." Both these species are cut and dried in the summer months, and form nearly the only fuel the Tartars are possessed of.

Lower down the glen, the hills assume a more desolate appearance; the furze grows scantily and at last fails altogether, leaving a bare and crumbling soil, which is annually precipitated in quantities by the action of the weather into the stream which winds its way down to join the river Lee. Over the upper part of these hills the furze is also abundant, as well as an aromatic plant, which furnishes an excellent pasturage in most of these elevated regions, where grass is either scarce or not at all procurable, to large flocks of sheep and goats, as also to the cows and yaks, which are seen sometimes, to the traveller's danger and dismay, scrambling along the whole hill-side, and hurling down stones and fragments of rocks directly on his path. It often happens too that large masses are detached by the action of the frost, and come tumbling down with a thundering crash into the glens below, rending and tearing up the soils in their descent, and scattering the fragments in volleys into the air. One of my coolies had a narrow escape from a fragment of rock, below the Hungrung pass; a mass that had hitherto been supported by the bed of snow into which it had alighted from above, was now by the thawing of the snow again let loose, and came bounding down the hill with horrid crash, until striking on a projecting crag, it was shivered into fifty fragments, one of which fell in a direct line for the coolie, who frightened at the sight, and hampered by his load, fairly stuck fast to await the coming blow. By the greatest good luck he escaped unhurt, though the stone alighting full in the kiltah on his back rolled him head over heels down the side of the hill. He soon recovered himself, however, when it was found that the only damage done was a crushed leg, not of the coolie, but of *mutton*; my provisions being in the unfortunate kiltah.

On crossing the Hungrung pass a most remarkable alteration is observable in the aspect of the country. The range on which the pass is situated forms part of the northern boundary of Kunawur, separating it from the Tartar district of Hungrung, now forming a portion of Bussaher, although evidently at some former period it has been sub-

ject to, and constituted with the Spiti district an integral part of Chinese Tartary.

The change in the nature of the country is most sudden ; looking from the summit of the range in a northerly direction over Hungrung, the country is seen to wear a sad and sombre air of cheerless desolation ; not a tree is to be seen, and the black and crumbling hills are either wholly barren, or clothed with nothing of larger growth than the dwarf willow and the dog-rose. The hills are chiefly of the secondary class, and being more rounded in their outline, want the grand and almost terrific beauty of the towering granitic peaks which so strongly characterises the scenery of Kunawur. Villages are situated at wide intervals from each other, and cultivation is wholly confined to the immediate vicinity of them, and usually upon a confined patch of alluvial soils, evidently the deposits of some former lakes. The practice of cultivating in steps upon the mountain's sides, appears indeed to be almost universally neglected, which however is most probably owing to the nature of the hills themselves.

On the southern side of this range lies the thickly wooded district of Kunawur, where cultivation is often carried in steps nearly to the summit of the mountains, and presenting a rich and cheerful picture which delights the eye, and imparts a feeling of joyousness and security to the traveller, as he wanders on through forests of majestic pines.

From this difference in the appearance of the two districts and their inhabitants, it would seem as if nature had elevated or interposed the Hungrung range as a barrier between two countries, destined, for some purpose, to remain distinct ; and furnishes to the inquisitive a source of speculative thoughts, from which it is difficult to draw any satisfactory conclusions, for the mind is almost involuntarily lead to ask while contemplating this marked contrast, *why*, on the one side the forests should be allowed to advance actually to the mountain's base, while on the other not a single tree should be allowed to grow.

From Hungo, on the morning of the 9th of June, I proceeded to Leeo, which is a small village situated on the right bank of the Sing Pho or Lee river, in a basin or valley entirely surrounded by high granitic rocks. The spot has evidently formed part of the bed of a deep lake, the different elevations of the water being still apparent in the lines of rolled stones, which are seen on the hill-side, far above the level of the river.

The bottom of the lake, now furnishes a broad and level tract of land which is well cultivated, and from its warm and sheltered situa-

tion in the bosom of the hills, is highly fertile, producing in favorable seasons two crops, consisting of wheat, celestial, beardless, and common barley, with beans and peas. Apricots too are abundant, but this is the last village towards Spiti where they occur. The elevation is however only 9,362 feet, or about that of Soongnum in Kunawur.

From Leeo, I proceeded towards Chung or Chungo, leaving the village of Nako on the heights to the right. At Leeo we crossed the Lee by a crazy and not very agreeable sangho, the planks being so far apart that the water was seen rushing along at a fearful rate beneath, dazzling the eyes with the glare of the foam, as one looked down to secure the footing; a very necessary precaution, as the bridge from the bank slopes with a disagreeable curve towards the centre. From this we ascended to about 2,000 feet above the stream, which was a steep pull up, though luckily we had a cool and cloudy day. The road, which is very rocky and leads along the left bank of the Lee, lies generally over immense beds of fragments brought down by the elements from the heights above, and after one or two moderate ascents and descents, dips suddenly down, at the distance of nine miles from Leeo to the village of Chungo.

On the 12th of June I halted at this place for the purpose of laying in several days supply of grain for my people, in case we might not be able to procure any in Spiti, which, according to accounts we had received at Soongnum and other places in Kunawur, had been plundered of every thing by Runjeet's troops, after they had expelled the Rajah of Ladak. The Tartar guide, however, who accompanied me, declared the rumour to be false, as he had lately been in Spiti and found no lack of grain, and he therefore advised me not to burden myself with more coolies, which would be necessary if I carried supplies. In order to be safe I thought it advisable to carry a few days provisions in case of emergency, and lucky it was that I did so, for without them my people would on more than one occasion have had no food at all.

Chungo is situated in a basin somewhat similar to that of Leeo, but much more extensive; it is walled in as it were on every side by lofty hills, whose sides in many places bear witness to the former presence of a lake. Large beds of clay and sand enclosing rolled and water-worn pebbles of every size occur on all sides, while the flat and level bottom of the vale again furnishes a broad tract for cultivation. The elevation of Chungo is about 9,897 feet. It was once a populous and thriving place, containing nearly one hundred people, but for some



years past it has been on the decline, and is now half in ruins and deserted by most of its former inhabitants. The reasons for this falling off are entirely attributable to local circumstances.

The soil is a mixture of clay and sand, the latter predominating, and is a deposit from the waters of the lake which once filled the valley. The whole area formerly under cultivation might probably have exceeded one and a half mile square, although at present it scarcely equals one. Celestial, beardless, and common barley, wheat, phuppra, beans, and peas, constitute the crops, and one harvest is all that is obtained; which is not to be wondered at, when we consider that on the morning of the 12th of June, at sunrise, the thermometer indicated a temperature of 35°. Snow was still lying on all the surrounding heights, and fell throughout the day on the 10th and 11th of June. In former days ere the cold soil was exhausted by the constant growth of the same crops, Chungo was at the height of its prosperity, and could even export grain to other parts, so abundant were its harvests. But alas! too soon "a change came o'er the vision of its dream," and those days are gone, now never to return.

The constant drain upon a soil naturally poor and cold, soon changes its hitherto smiling and prosperous state to one of want and poverty. The barrenness of the surrounding hills, yielding not even a scanty pasturage to sheep and cattle, at once destroyed the chance of recruiting the soil, by depriving the cultivator of the only source from whence manure might have been procured; and thus, from gathering an abundant crop, the villager was first reduced to a bare sufficiency for the wants of himself and family, and finally obliged to leave his fields untilled, and to seek employment and subsistence in a happier clime. Many have thus emigrated into Spiti, Chinese Tartary, and other places, and their once well cultivated fields now exhibit a bare and hardened sand without one blade of grass, and strewed with the fragments of rock which the weather has hurled upon them from above. Could these people command annual supplies of manure, as is the case in many parts of these hills, Chungo would possess perhaps a finer cultivation than any village in Hungrung. In Kunawur it is a common practice to mix up leaves and the young shoots of the pine trees with the dung of cattle, and this forms a capital manure for their fields, which would otherwise, in many parts, soon become nearly as impoverished as the soil of Chungo. They have moreover in most parts of Kunawur a rotation of crops, by which the soil is recruited, whereas at Chungo, one crop, and that the same for years, is all that can be produced. This village has not a tree near

it for two or three days' journey, save the usual sickly looking poplars, which are planted on the banks of rivulets and streams ; thus they are deprived of all manure both animal and vegetable, and their lands will in consequence go on dwindling from bad to worse until the place shall become barren and deserted.

The lands which are now under cultivation are coaxed to yield a scanty crop, by the annual small quantity of wheat and barley straws which are ploughed in, and by the addition of the small portion of dung which is obtained from a few goats and cows which graze on the edges of the fields, where grass and a yellow flowering lucerne spring up abundantly along the banks of the little rills, with which the fields are irrigated.

On the 13th of June, I again proceeded towards Spiti by a road which led us up the heights above Chungo. Many places on this day's march indicated the former existence of a deep water over the hills, at a height of 2,500 and 3,000 feet above the present channel of the river, which winds along beneath. Here the road stretches along the sides of hills shelving gradually towards the stream, along whose banks are wide and extensive level plains of several miles in area, and the hills receding on either side form a wide valley, bare of every sign of vegetation save the furze, the dog-rose, and the willow, with here and there a few dwarf bushes of the cedar. Trees there are none, and villages are now not seen for many days. All around seems cold and cheerless ; not a living thing to break the deep silent melancholy which pervades the scene, and the traveller feels chilled, and his spirits flag, he knows not why, as he wanders on through the dreary and barren waste.

How marked a contrast does the scene present to the rich and wooded regions of Kunawur ; here all is black and charred, and a mournful silence reigns around, unbroken save by the hoarse roar of the mountain stream, or the shrill whistle of the Bhair among the snows.

Journeying onwards from our last encampment, we came suddenly upon a deep rent or chasm in the rocks, through which at some depth below ran a rapid stream. Over this, from rock to rock a few loosely twisted ropes or withes of willow twigs were stretched to answer for the purpose of a bridge, and on these were placed large flat slabs of mica slate, apparently sufficient by their own weight alone to break through their frail support. Over this we walked, and though somewhat springy and unsteady to the tread, it was nevertheless perfectly strong, and is the only bridge for passengers and cattle. At a little distance from where we crossed, alarmed by the noise we made, up

started from among the rocks a small flock of *Burrul*, or wild sheep, which began leisurely to scale the steep sides of the glen, springing from ledge to ledge till they attained to a place of easy ascent, when, as if satisfied that they could bid defiance to pursuit, they stopped to survey our party. A shout from some one in the rear, again set them in motion towards the summit of the mountain from which we had just descended; the direction they took, lay right across the path, and just at the moment when they gained it, my shikarree came in sight, on a part of the hill above them, a shrill whistle from one of the Tartars caught the ear of the hunter, who was soon instructed by signs to blow his match and give chase.

From his greater elevation he was able to bring himself near the line the animals were taking, and at the same time to screen himself from their view until just within gun-shot, when they perceived him. In an instant a flash was seen, and the sharp crack of the matchlock, ringing in echoes among the rocks, told that the quarry had come within reach, and at the same moment off bounded the flock towards the most inaccessible part of the mountain. The shot however had not been fired in vain, for suddenly the leading sheep was seen to turn downwards and avoid the rocks, as if conscious that he had not power to scale them, and taking an easier and more slanting direction along the side of the cliff, he soon slackened his pace and laid down. The rest of the flock losing their leader turned downwards also and rejoined him. The shikarree in the meantime had reloaded, and was again warily stealing on from rock to rock upon his game, but they were now fully on the alert, and once more leaving their wounded companion, bounded up the rocks at a rapid pace. Again the bright flash of the matchlock was seen, but alas, this time there followed no report, and ere the hunter could reprime, the sheep had won the mountain's brow and disappeared. Nor had the wounded animal failed to avail himself of the chance afforded for escape, but scrambling along the side of the rocky glen, he was fast gaining on a place where a turn of the mountain would have screened him from our sight, when scrambling up a rugged and projecting ledge his strength failed him, and falling backwards with a cry of terror, we saw him, for a while quivering as he fell headlong from rock to rock, and was lost in the rush of waters at the bottom of the chasm.

No village occurring this day to bless our longing sight, we at length encamped, after a long march, on the side of the hill, at a spot where sheep are usually penned for the night when travelling with

grain. This spot was called by the Tartars Chungreezing, and here I pitched my blanket-tent at the height of 12,040 feet above the sea. We passed a cold and comfortless night owing to the high keen wind which came whistling down from the snowy peaks above us. At sunset the thermometer stood at 48°, and at sunrise on the morning of the 14th of June, again at 35°! A nice midsummer temperature! what must the winter be? On the 14th we descended by a very rugged and precipitous pathway to the bed of the Paratee river, a branch of the Lee, which comes down from lake Chummor-rareel, through Chinese Tartary, and joins the latter river above Skialkur. This we crossed by the "stone sangho," as it is called, which is formed by several enormous masses of granite which have fallen from above, and become so firmly wedge into the bed of the river, as to form a safer and more durable bridge than any that could be constructed by the natives, and which from its great weight the waters are unable to remove. A small stream which runs down into the Paratee, a little distance below this bridge, is said to be the boundary line of Bussaher and Chinese Tartary.

Here then we were in the dominions of the celestial emperor, and as we crossed the sangho we were met by a deputation from the Chinese authorities, who demanded to know what were our intentions in entering their country, and how far we had determined to travel through it, intimating at the same time very politely, that they would "prefer our room, to our company," by telling us that we need expect no assistance or supplies of any kind. I had no intention of penetrating farther than was requisite into their country, but this being the only road yet open into Spiti, I had been necessarily compelled to follow it, as after all it merely ran across a corner of their territory for about a mile or so. Wishing however to ascertain whether, after having gone through the ceremony of prohibiting our advance to satisfy their rulers, they could not be prevailed upon to wink at our proceedings, I told this rough ambassador that I would require no supplies, nor take anything from the country, if he would allow me to proceed as far as Choomontee. His reply was evidently borrowed from the Chinese officers, and was worthy of the great Bombastes himself;—"When horns grow from the heads of men, and wool is gathered from the rocks; then may the Feringee advance,—but not till then!" This was too ridiculous to be withstood, and we enjoyed a hearty laugh, while the dignified officer strutted away, pleased with the assurance that I was only crossing into Spiti.

His words brought to mind the old Scotch ballad,

“ The swan, she said, the lake’s clear breast,  
 May batten for the eagle’s nest ;  
 The Awe’s fierce stream may backward turn,  
 Ben Cruachan fall and crush Kilchurn,  
 Our kilted clans when blood runs high,  
 Before the foe may turn and fly ;  
 But, I, were all these marvels done,  
 “ Would never wed the Earlie’s son.”—

And I thought it by no means improbable that the sequel might turn out after the same fashion ;—

“ Still, in the water lily’s shade,  
 Her wonted nest the wild swan made ;  
 Ben Cruachan stands as fast as ever,  
 Still onward foams the Awe’s fierce river ;  
 Before the foe when blood ran high,  
 No Highland brogue has turned to fly ;  
 Yet Nora’s vow is lost and won,  
 She’s married to the Earlie’s son

and so it may be hereafter that the “ Feringee” shall tread those now forbidden scenes, though his head be unadorned with horns, and wool be not gathered from the rocks.

It appears however from the accounts of the people, that so many travellers have at different times wandered through the upper hills, without any apparent object, save that of looking at the country, that the suspicions of the Chinese have been kept on the alert, and they are more particular than ever in enforcing their orders, especially since Runjeet’s troops in Ladak have thrown out some hints of paying them a visit, when they have settled the affairs of their late conquest. There is however little chance of their carrying the threat into execution, as Chinese Tartary holds out to them no chance of plunder save its splendid flocks of sheep, which would easily be driven far beyond their reach, and leave them a barren waste for their portion.

Having crossed the stone sangho, we proceeded up the side of a hill by what the guide termed a road, though I could not distinguish it from the surrounding mass of crumbling soils. It got better, however, as we gained the top, and a short distance brought us to a small stream, across which we stepped out of Chinese Tartary into Spiti, dependent on Ladak. From this we travelled for some miles along the side of a bare black hill of decomposing shale, and then descending to a level plain of clay and rolled stone, we crossed a river which the Tartars called “ Gew,” from its passing a village of that name in Chinese Tartary. Above this river on the opposite bank, the beds of

alluvial clays towered up to some height, and the surface being flat and studded with a few bushes was pointed out as the usual halting place. As by halting here however we should have had a long and fatiguing march on the morrow to Larree, I thought it advisable to push on for another level spot, a couple of miles farther, where the Tartars said there was a stream of good water, and shelter beneath the rocks for all my people. The road now ran along the left bank of the Spiti river, at about 300 feet above its level.

The Spiti is a larger and finer looking river than the Sutledge, and the people of the country, as well as the Kunawurees who have seen the two, say that it is never equalled by the latter, except during the winter months, when the severity of the frosts in the districts through which the Spiti flows, causes a less plentiful supply of water to fall into it.

Its waters though rapid and muddy, have in general far less of that dashing violence which the Sutledge exhibits. This is most probably to be attributed to the nature of the country through which it flows. The Sutledge winding its rapid course among hard rocks of the primary formation, must often meet with obstacles, which cause it to break in impotent fury on its banks, in waves which hurl the spray far on high, curling and bubbling as it flows along over stones and boulders of various sizes.

The Spiti, on the other hand, though sometimes violent and rough, more generally glides along in a broad and rapid sheet through rocks belonging to the secondary class, and whose less firm and solid texture yields to the action of the current, which sweeps their crumbling fragments irresistibly before it.

The observations of Dr. Gerard also serve to corroborate the information furnished by the natives relatively to the two rivers. According to that traveller, the greatest breadth of the Sutledge at its narrowest parts where bridges occur is 211 feet, while at other places he measured it 450 feet across. This however is low down, and after the river has received the additional waters of the Spiti and Para, united in the Lee; the true comparison therefore cannot be formed, after the junction of the two rivers, but before.

At Skialkur, according to Gerard, the Lee in breadth was ninety-two feet, and in August he thought it contained fully as much water as the Sutledge, than which it was broadest, the latter river being at their confluence but seventy-four feet. The true comparison of the Spiti and the Sutledge, must be instituted however, before the junction of the Paratee with the former, and of the Lee with the latter,

and we consequently find from the measurements of the enterprising traveller already mentioned, that the general breadth of the Spiti was from 256 to 274 feet across.

In October, he states the quantity of water to be less than that of the Sutledge, which being the season when the rigors of winter have begun in Spiti, is exactly a result corresponding to the information derived from the inhabitants of the district.

After the waters of the Spiti and Paratee rivers have united to form the Lee, the Tartars usually apply to it the name of "Singpho," which in their language appears to signify "a river"; while smaller streams and muddees, are called "Rokpho," or nullahs. Each river is therefore distinguished by the name of the country through which it flows, or sometimes even by that of a village on its banks. Thus the Lee evidently derives its name from the village of Leeo, and is the "Lee-ka-Singpho"; the Paratee, rising from lake Chummor-rareel, and flowing through Chinese Tartary, is called the "Cheen-ka-Singpho," or "Para-ka-Singpho," derived from the Para or Paralassa mountains; and the Spiti is the "Spiti-ka-Singpho." The word Para signifies lofty, and thus Paratee is literally, "Lofty-water," or a "river of high source," "tee" signifying water in Kunawur. Paralassa would therefore appear to signify a lofty mountain range, as "Kylas" is known to signify lofty peaks in Kunawur. The Lingtee, a minor stream which joins the Spiti above Dunkur, but of which Gerard makes no mention; and the "Gew" flowing down from Chinese Tartary into the Spiti below Larree, receive the names of "Lingtee-ka-Rokpho" and "Gew-ka-Rokpho" both derived from villages on their banks. After resting awhile beneath the shade of an overhanging rock and refreshing myself with a few hard biscuits, and a draught from the turbid stream, we again set ourselves in motion, and a walk of two or three miles brought us to an extensive piece of level ground, where the guide said we were to encamp, and accordingly we halted, right glad to get a rest and shelter from the sun, in the shade of the rocks around us.

Creeping into the caves which are scooped out by the wandering shepherds as a place of shelter for the night, most of the party soon fell fast asleep, for we had travelled several miles in a temperature of 120°, and the glare from the rapid waters below our path, in conjunction with the heat from the rocks, tended to induce a feeling of languor and fatigue, which from the proximity of the snow on the heights above us, we had little expected to feel. We had thus wiled away about two hours in the arms of Morpheus, when we were aroused

by the noise, arrival of some of the people with my tent and baggage, and proceeding in search of water, we now first ascertained to our dismay that the stream was dry; fuel, too, another most essential necessary, was likewise wanting; so bestowing a few hearty growls on the Tartar for his stupidity, we once more proceeded in search of a snow stream and some bushes.

Luckily we soon came to a spot which furnished the latter, but as there was no stream near we were obliged to content ourselves with the water of the muddy river.

Here then we encamped once more on the hill side, without having seen the vestige of a habitation throughout this second day of our wanderings in Spiti. Around us, however, were plenty of rocks to afford shelter to my people in case of a storm or bad weather, and as the day was fine and warm, we managed to make ourselves tolerably comfortable in spite of muddy water, and a scarcity of fuel, which latter consisted solely of the dried stalks and roots of a small shrub growing among the rocks near us.

During the day's march we had passed over many level tracts of alluvial soils which seemed so well adapted for cultivation and villages, that I remarked to the guide my surprise that so much level land should remain neglected, while so much trouble was expended in Kunawur on strips on the hill side. He replied that many a long-ing eye had often been directed to these plains, but the difficulty or rather impossibility of conveying water to them, had deterred all from settling there.

These broad alluvial deposits are now all high above the river's course, and from the precipitous nature of the rocky banks within which it is confined, no aid could be derived from it.

Rain is here almost unknown, falling only like angel's visits, and even then so sparingly as to be of no use except to allay the clouds of dust for a few hours.

The only season, then, in which much moisture is obtained, is precisely that in which no vegetation can be produced, namely in the winter months, when falls of snow are both heavy and frequent, and continue often, more or less, from August till the end of April.

Of these broad flats the people would gladly avail themselves could water be procured to irrigate them, and smiling fields and prosperous villages would soon appear where all is now barren and desolate. On similar deposits are the villages of Leeo, Chango, Soomra, and Larree, built where streams flow down from the surrounding heights to fertilize the soil. They are, however, almost all subject to a great



want of manure, and their fields in consequence soon become impoverished, and do not yield a suitable return for the care and labour which are bestowed upon them.

Thus at each of these places, with the exception of Leeo, many fields once under cultivation are now left barren, and their owners have been compelled to seek that subsistence for their families in some more favoured spot, which their native soil denied them.

THOMAS HUTTON, *Capt.*

CANDAHAR,  
8th December, 1839.

*Assistant Paymaster and Commissariat  
Offl. S.S.F.*

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ART. III.—*Notes on various Fossil Sites on the Nerbudda ; illustrated by specimens and drawings.*

In the following paper I propose to place on record the progress made in fossil discoveries from Hoshungabad up the Nerbudda river, to Jubulpoor, a distance of some 200 miles.

Hoshungabad has already been brought to the notice of the Society as a large deposit, a field zealously followed up by Major Ouseley, then in charge of that district, by whose exertions the upper jaw now laid before the Society has been brought to light, having served for years, unknown, as a Dhobee's board for washing clothes on, ere a cognoscent eye lit upon it; for at first, it had the appearance only of an oblong square mass of the conglomerate of the river, excepting at one small point, which led to its development and present form. I am sorry to say that some of the teeth were injured in entrusting the chiselling to a country gentleman, whose geological notions of matrix and fossil, were not matured. The teeth of this elephantine head are thought by a friend of mine, to belong to that species denominated African.

The second specimen laid before the Society, is that of a slender tusk, imbedded in the conglomerate of the river, the several pieces of which, joined together, amount to a length of five feet nine inches and a half. To what animal did this belong? The portion of tusks of elephants that we possess, being at least treble the present in circumference.

Next are drawings No. 3 and 9, frontal and base of a Buffalo skull, from the same locality; exhibiting in one, the condyles of the foramen magnum, orbit; portion of horn, and general base of the skull; the other shewing the massy forehead, (nearly eleven inches between the orbits), and angle of the horn in contrast with the Bovine skull to be noticed hereafter.





No. 4, are drawings of the vertebræ of the Mammoth ; the centre one, which is extremely perfect, was found imbedded\* in the same matrix as the foregoing, near the village of Blkore, some fifteen miles up the river from Hoshungabad. On the same paper a convex and concave view of another vertebra of considerably larger dimensions has been annexed, with their different measurements on the same scale, shewing their relative size. The latter was found in this neighbourhood.

No. 6, is portion of a ruminant jaw from near Niaghurreea, on the Barunj Nulla, and about a kos from Beltharee Ghat,\* on the Nerbudda. The specimens brought in have been chiefly similar jaws and cylindrical bones of either buffalo or bovine genus. This site has not yet been visited by us.

No. 7, a drawing of a Bovine skull, exhibiting some of the molar teeth. No. 8, is a frontal view of the same. This skull was for a long time unique, and was dug up at Heerapoor, on the right bank of the Nerbudda, at the junction of our boundary and the Bhopul state ; but since this, numerous skulls from near Jhansee Ghat have been sent in ; they are characterized by very large molars, and a great squareness of the occiput, a point not shewn in these drawings ; the horn is imbedded in matrix, so that its actual circumference is not easily determined, but it appears to fall short of the buffalo skull No. 3, and as it does considerably in breadth of forehead.

No. 10, 11, 12, are specimens from Brimhan Ghat, of two skulls and a cylindrical bone. This site was first brought to notice by myself in 1833, subsequently explored by Captain M. Smith, then in charge of the Saugor district, and latterly by Mr. C. Fraser, the Agent. The chief specimen† was the head of a mammoth ; the dimensions of which, as compared with a recent skull of an animal seven feet high, were enormous. The foramen magnum of the occiput was three inches and a half ; diameter of tusk at base, six and a quarter inches ; and as it stood on the occipital condyles, the height was thirty-three inches ; breadth of the molars four inches. The fossil remains here have been chiefly those of the elephant and bovine classes.

From Brimhan Ghat, proceeding upwards, we come to Sagounee and its neighbourhood—sites from which I sent numerous specimens that have been laid before the Society, and among them a buffalo head with horns (a delineation of which was promised in my preceding communication) with one sent down by Serjeant Dean from the Jumna.

\* From this Ghat, in 1834, I forwarded fossil specimens, pronounced to be those of a horse.

† It has been sent to Capt. Cautlay for comparison with those of the Sivalik range.

Our next site is Jhansee Ghat, where the bivalves (drawings of which were lately forwarded for inspection) have been found. This place and its neighbourhood has yielded a large collection of fossils, but chiefly buffalo and bovine; vertebræ and leg bones of the first, and large skulls of the latter, bearing the same character as that delineated in No. 7. From this ford all the way up the river fossils have been found. At the Jogee Ghat, three miles below Berah Ghat, the upper portion of the head of a young hippopotamus was discovered, as shewn in No. 14. The upper coloured drawing gives a view of the entire fossil on a reduced scale, and the pencil one below a profile, natural size, from the anterior to the posterior molars of the left side. This is the first and only one of the kind; almost all our collections being derived from the elephant, horse, buffalo, and latterly a large bovine class, as noticed before.

In the ravines of the Nerbudda, close to Berah Ghat a fine lower jaw of a mammoth was excavated and brought in, of which No. 15 gives an accurate facsimile, and some idea of the stupendous animal it was originally attached to.

Above Jubulpoor, as far as our present researches extend, but few fossil remains of quadrupeds have been found, the perfect head of a horse (drawings of which were laid on the table some two years ago) forming one of the few exceptions.

From Chewlea upwards, fossilized trees of various kinds and shells alone reward the zeal of the philo-geologist.

For the interesting fossil discoveries from Jubulpoor to Jhansee Ghat the lovers of this pursuit are indebted to Mr. C. Fraser, the present Agent to the Governor General in these territories, who from the time of his rejoining this agency, has been most indefatigable in bringing to light these treasures of a former age.

I cannot pass over the aid I have derived in my illustrations\* of the fossils for the present notes (as well as those lately submitted of the different kinds of shells, chiefly found in these territories,) without saying how much I am indebted to the pencil of Captain Reynolds, whose kindness and readiness to devote his time and talent to the delineation of the numerous specimens sent to him, have been unwearied.

N. B. Just as the foregoing was concluded, a fossil crab was brought in from near Jhansee Ghat, a drawing, No. 16, natural size, exhibits this as yet unique specimen.

JUBULPOOR, 1st Nov., 1839.

G. G. SPILSBURY.

\* No. 3 is by Mr. M. C. Ommanney—not the first instance, by many, that I have had of his ability and kindness.

ART. IV.—*Proceedings of the Asiatic Society.*

(Wednesday Evening, the 5th February, 1840.)

The Proceedings of the last Meeting were read.

HIS EXCELLENCY SIR JASPER NICOLLS, Commander-in-Chief, &c. &c. and MAHA-RAJAH RAHMUT ALI KHAN, proposed at the last Meeting, were ballotted for, and duly elected Members of the Society.

The Society then proceeded to the election of Vice-Presidents and the Committee of Papers for the ensuing year, when the following gentlemen were chosen:—

*Vice-Presidents.*

|                                |                                   |
|--------------------------------|-----------------------------------|
| The Honorable Sir J. P. GRANT. | The Honorable H. T. PRINSEP, Esq. |
| Colonel D. McLEOD.             | The Honorable Sir H. SETON.       |

*Members of the Committee of Papers.*

|                     |                  |
|---------------------|------------------|
| W. GRANT, Esq.      | Dr. D. STEWART.  |
| Major W. N. FORBES. | D. HARE, Esq.    |
| Dr. J. McCLELLAND.  | H. TORRENS, Esq. |
| Dr. N. WALLICH.     | Dr. GRANT.       |

Mr. James COLQUHOUN proposed by Mr. SUTHERLAND, seconded by Dr. O'SHAUGHNESSY.

Captain SWETENHAM proposed by Major FORBES, seconded by Mr. SUTHERLAND.  
C. K. ROBISON, Esq. proposed by Major FORBES, seconded by Mr. SUTHERLAND.

Mr. Thomas Charles CADOGAN proposed by Mr. BAGSHAW, seconded by Sir H. SETON.

Mr. R. H. MATHEWS proposed by Mr. BAGSHAW, seconded by Mr. H. T. PRINSEP.

The officiating Secretary informed the meeting that the Committee of Papers propose M. RENAUD as an Honorary Member, in succession to the late illustrious M. SILVESTRE DE SACY.

Read the following letter from Professor H. H. WILSON, dated East India House, 3rd December 1839, intimating his having forwarded through Messrs. ALLEN and Co. the busts of Sir W. JONES and Mr. H. T. COLEBROOKE.

*East India House, 3rd Dec. 1839.*

MY DEAR SIR,—I have an opportunity of acknowledging your late, as well as your former overland letter at the same time. As the letter of the 27th August reached me this morning, just in time for to-morrow's mail, there will not be time to attend to any of its contents before the dispatch is made up, but I will make the inquiries respecting the anatomical plates without delay. There would be no difficulty in printing the work altogether in this country, and both for the sake of science and my friend MODHUSUDAN GUPTA I should willingly act as editor; he would probably, however, prefer correcting his own work.

I have recently dispatched to you, through Messrs. ALLEN and Co., the busts of SIR W. JONES and Mr. CLEBROOKE, which I doubt not will afford the Society much satisfaction. The bill remitted by you of 136*l.* has been realised, but the charge is a trifle more, being 142*l.* 10*s.* including the expense of reducing the bust of Sir W. JONES from the more colossal proportions of the statue in St. Paul's, and the expense of packing. I have paid the balance. The funds you have placed at my disposal will probably allow it to be deducted from them without inconvenience, if not, I can draw upon the Society for the amount.

Mr. JAMES PRINSEP, I am sorry to state, continues in the same condition. There is no sensible improvement, but he is not apparently worse than he was six months ago.

Yours very sincerely,

H. H. WILSON.

To Dr. O'SHAUGHNESSY.

Resolved—That the amount advanced by Professor WILSON, for the purposes above mentioned, be forthwith remitted to him, with a suitable acknowledgment of the trouble he has taken in forwarding the busts.

*Library.*

Read a letter from the Secretary to the Royal Society of Northern Antiquaries of Copenhagen, acknowledging the receipt of two specimens of ancient warlike weapons, presented by the Society through Dr. CANTOR, and intimating his having forwarded several articles for the use of the Society.

*Royal Society of Northern Antiquaries,  
Copenhagen, 18th October, 1838.*

DEAR SIR,—We received by Dr. CANTOR your letter of 18th October last year, together with two specimens of ancient warlike weapons of copper, for our Museum. These we consider as of importance for our collection, and we shall take a future opportunity of writing more particularly on this subject. It would be very interesting if we could obtain a few more such matters of different sorts from India. Dr. CANTOR is a good judge of northern antiquities, and knows what will be of greatest interest to us in a scientific point of view.

I take the present opportunity to inform you, that I have dispatched from our Society to yours the following articles, which I hope will arrive safely.

By Peter HANSEN, Esq. Chief of the Establishment at Serampore (8th November, 1837.)—

The Annals of the R. S. N. A. 1836-1837, &c.

By Capt. RABE, to the care of Colonel REHLING, Governor of Tranquebar (18th April, 1838, and 18th October, 1838.)—

1. My work entitled, "*Antiquites Americænæ*," published by our Society.
2. My Memoir, separately published in French "*Sur la déconverte de l'Amérique au dixième siècle.*"
3. My general Chart or Map, in illustration of the voyages of discovery to America, performed by the Scandinavians.
4. My special Map of Greenland.
5. Sundry other Maps published by the Society.
6. Some facsimiles of Icelandic Vellum Codices (*skinnbækkr.*)
7. R. K. RASK's *Samlede Afhandlinger*, 3 die deel.

The great importance of the literature of India to the Scandinavian north, and conversely the importance of that of the latter to India, prompts to a more intimate connexion of our Societies.

I have the honor to be, Sir,

With sentiments of respect and esteem,

Your most obedient servant,

JAS. PRINSEP, Esq.

Secy. As. Soc. Bengal.

CHAS. C. RAFFRY, Secretary. R. S. N. A.

*Library.*

Read a letter from J. P. GRANT, Esq. officiating Secretary to the Government of India, Revenue Department, forwarding the following Books :—

Illustrations of Indian Botany, No. 12

Dr. WRIGHT'S Illustrations of Indian Plants, Nos. 11 and 12.

Read a letter from the Messrs. BOWDITCH, sons of the late Mr. N. BOWDITCH, forwarding for presentation the 4th volume of the "*Mécanique Céleste*, by LA PLACE," translated by their father, with a commentary.

*Boston, August 18th, 1839.*

SIR,—We send you, for the use of the Royal Asiatic Society, the first and last volumes of our father's commentary on the "*Mécanique Céleste*".

Before his death Mr. BOWDITCH prepared a few notes to the fifth volume, but they are imperfect, and therefore will not be published.

May we be allowed to refer to your notice the Appendix to the memoir of the translation, wherein you will find the disposition we have made of his library. In England our determination to make the "Bowditch Library" a free public institution, has been received with approbation by Sir JOHN HERSCHEL and others, and therefore we have taken the liberty of mentioning it to you.

We remain respectfully, yours,

N. J. BOWDITCH,

J. BOWDITCH,

F. D. BOWDITCH,

W. G. BOWDITCH,

Children of Nathaniel BOWDITCH

*To the Secretary of the Royal Asiatic Society, Calcutta.*

Resolved—That the thanks of the Asiatic Society be conveyed to the Messrs. BOWDITCH, for their valuable donation; and that the Society further offer their cordial approval of the generous resolution regarding the disposal of the Bowditch Library.

Read a letter from Major JERVIS, Provisional Surveyor General, conveying a brochure by M. REINHARD.

*Bombay, 10th Dec. 1839.*

SIR,—On my way through France by the overland route to this country, I was charged by my distinguished friend Monsieur REINHARD, Membre de l'Institut, to present the accompanying volume in his name to the Asiatic Society of Bengal. And although not as yet a member of your distinguished body, I venture to assure you



of the very warm interest which he and many other celebrated orientalists in France, Members of the French Institute, take in every thing connected with the objects of your Society.

I have the honor to be, Sir,

Your most obedient servant,

To the Secy. Asiatic Society.

T. B. JERVIS, Major of Engineers,  
appointed Provisionally Surv. Gen

Read a letter to the President from M. DUTROUILLY, Treasurer of the Académie Royale de Bordeaux, presenting copies of the Actes de la Société, requesting the Journal in exchange, and inquiring after the state of Mr. Jas. PRINSEP's health.

*Académie Royale des Sciences, Belles-Lettres et Arts de Bordeaux*

MONSIEUR,

Bordeaux, le 28 Aout, 1839.

L' Académie me charge de vous adresser les deux premiers numéros de ses Actes, elle vous prie de les offrir, de sa part, à la Savante Compagnie que vous présidez, elle se fera un vrai plaisir de lui adresser régulièrement les fascicules à fur et à mesure qu'ils paroîtront, elle espère que la Société Asiatique voudra bien lui continuer l'envoi de son journal.

L' Académie me charge aussi, Monsieur, de vous adresser un exemplaire de ses Actes, elle vous prie de l'agréer comme un hommage rendu à votre zèle éclairé pour les Sciences et les Lettres.

L' Académie a appris avec peine que l'honorable Monsieur PRINSEP l'un de vos Membres avait été dangereusement malade, comme elle n'a reçu aucune nouvelle de sa santé, et qu'elle a appris seulement qu'il avait été au Cap pour la retablir ; y aurait il de l'indiscretion, Monsieur, à vous prier de vouloir nous donner de ses nouvelles. Le service qu'a rendu à la science M. PRINSEP, le rend cher à tous ceux qui la cultivent, et particulièrement à l' Académie.

Veuillez, je vous prie, Monsieur, agréer et faire agréer à la Savante Société Asiatique l' assurance de la haute considération avec laquelle J'ai l' honneur d'être.

Monsieur,

Votre très-humble et très obéissant serviteur.

DUTROUILLY,

Trésorier de l' Académie Royale des Sciences  
Belles Lettres et Arts de Bordeaux.

Resolved unanimously,—That the thanks of the Society be offered to the Académie de Bordeaux, and the Journal regularly forwarded as desired. The Secretary was farther instructed to communicate to M. DUTROUILLY the latest intelligence regarding Mr. PRINSEP.

The following Books were presented .—

Outlines of the Topography and Statistics of the Southern Districts of Oudh and of the Cantonment of Sultanpore, Oudh, by Dr. D. BUTTER, —by the Author.

Transactions of the Royal Irish Academy, vol. 18, in 2 parts, —by the Academy.

Description of an Observatory established at Travandrum, by His Highness the Rajah of Travancore, by John CALDECOTT, Esq. Astronomer to His Highness, — by the Author.

Annuaire des Marées des Côtes de France pour L'an 1839, publié au Dept. de la Marine. Par A. M. R. CHAYALLON.

Mémoire Sur les Divers Moyens de Se Procurer Une Base. Par A. M. R. CHAYALLON.

Nieuwe Verhandelingen der Erste Klasse, Van het Konin Glijk Nederlandsche Institut, vol. 6 and 7.

Solemnia Natalitia Regis Augustissimi ac Potentissimi Frederici Wilhelmi III. ac Aug. III edited by Professor A. G. SCHLEGEL, Bonn 1839,—*by the Author.*

Mémoire sur le système Grammatical des Langues. Par M. P. et Du Ponceau. L.L.D.—*by the Author.*

The American Almanac and Repository for 1839—*by the American Philosophical Society.*

The East Indian Journal, No 2, by R. C. WOODS, L.L.D.—*by the Author.*

A Sketch of the Argument for Christianity and against Hinduism, (*Sanscrit*) by J. MITR, Esq. B.C.S.—*by the Author.*

Meteorological Register for December, 1839—*by the Surveyor General.*

The following books were received from the booksellers —

Journal des Savans, for May and June, 1839.

Lardner's Cabinet Cyclopædia—History; vol. 2.

Illustrations of Ornithology, by JARDINE and SELEY, purchased from a number for Co's. Rs. 100.

#### *Literary*

Mr. Secretary PRINSEP forwarded on the part of Government the following papers for publication in the Society's Transactions, or in its Journal.—

Dr. J. W. HELFER's third and fourth Report on Tenasserim, the surrounding nations, inhabitants—natives and foreigners, character, morals and religion.

Dr. RICHARDSON's Proceedings on his Mission to Siam and the Shan states, with a Map of Siam.

Dr. CAMPBELL's Notes on the Mechtis, with a Vocabulary of their language.

The officiating Secretary apprized the Meeting of his having received from Lieut. T. HUTTON the first part of his "Journal of a trip through Kunawur, Hungrung, and Spiti," to the expenses of which the Society had contributed a sum of 1000 Rs. pursuant to the resolution passed at the Meeting held on 1st Nov. 1837, (J. A. S. vol. 6 p. 898.)

Mr. J. W. LAIDAY forwarded a paper on Mohammedan Coins

#### *Museum.*

The officiating Secretary then requested the attention of the Meeting to a very important dispatch recently received from the Court of Directors.—This dispatch rendered it necessary to assign 250 rupees per mensem to the salary of a Curator.—The Committee of Papers had taken the subject into their serious consideration, and their Minutes are accordingly appended to the official letter.

TO W. B. O'SHAUGHNESSY, Esq. M.D.

*Officiating Secretary to the Asiatic Society*

No. 1280.

*General Dept*

Letter from the Honble. Sir E. RYAN, Kt. President of the Asiatic Society, dated 21st June, 1837.

Ditto to ditto, dated 28th June, No. 261.

Ditto from Secretary Asiatic Society, 10th July.

Ditto to ditto, dated 26th ditto. No. 328.

Ditto from ditto dated 12th ditto, 1838.

Ditto to ditto, dated 18th ditto. No. 844.

(Para 81 to 87)

SIR,—With reference to the correspondence noted in the margin. I am directed to transmit to you, for the information and guidance of the Society, the accompanying Extract from letter No. 17, of 1839, from the Honorable the Court of Directors, in the Public Department, dated 18th September.

I am, Sir,

Your most obedient servant,

COUNCIL CHAMBER

H. T. PRINSEP,

26th December, 1839

Secy. to Govt. of India.

*Extract from letter No. 17 of 1839, from the Honorable the Court of Directors in the Public Department, dated the 18th September.*

Applications from the Asiatic Society of Calcutta to the Government for assistance.

*Letter of 30th Aug 1837.*

Forwarding correspondence with Sir Edward Ryan, the President of the Society, soliciting the aid of Government to the amount of rupees 200 per mensem, in maintaining the museum of antiquities and natural history already commenced by the Society, but which must fail without such aid; also requesting permission to purchase antiquities, manuscripts, and objects of natural history and science to the extent of rupees 800 per mensem, on the engagement that the objects shall be placed at the disposal of the Government if the Court should decline to sanction the measure. The subscription of rupees 200 per mensem was sanctioned, and it was intimated, with regard to the latter application, that the Government declined a fixed grant, but would be ready to receive recommendations for the purchase of objects of more than common interest.

*Letter of 12th Sept. 1838.*

Reporting that the Government had acceded to the application of the Society by giving retrospec-

Para. 81. Your letter of the 30th August, 1837, forwards an application from the Asiatic Society of Calcutta soliciting the aid of the Government for the extension and maintenance of their Library and Museum, submitted to you with a letter from Sir E. Ryan, the President of the Society.

82. The objects of the Society, as set forth in their resolution of the 7th June, 1837, and then President's address, are the means of providing for the services of a professional naturalist to superintend and systematize their collections—of defraying the cost of preserving—of displaying the collections of curious and instructive articles already made—and of procuring additional objects illustrative of the geography, antiquities, statistics, mineralogy, conchology, botany, and natural history of India. In order to accomplish these purposes they estimate that in addition to their own available resources, an annual expenditure of 10,000 rupees is necessary. Although however specifying this sum as the amount of the aid which they are desirous of receiving, they leave it to you to fix the extent of any grant which you may deem it expedient to afford.

83. In your reply to the President of the Society you acknowledge the claims of the Asiatic Society of Bengal to the gratitude of the public, both in Asia and in Europe, for the persevering and successful efforts it has made, for more than half a century, to investigate and illustrate the literature, science, and natural and artificial productions of the East. You recognize the advantages which may

tive effect to the monthly allowance of rupees 500 granted by the Court for the publication of oriental works, as the Society had published several works before the receipt of the Court's sanction, and had thereby incurred a debt of rupees 2,500

be expected to result from the extension of the Society's Library and Museum, and you admit the impossibility of this extension being effected, unless the Society be aided liberally by the Government, in like manner as similar institutions in Europe are supported by the Public Treasury. At the same time you declare yourselves precluded from giving an immediate sanction to the specific

annual grant suggested by the Society in this instance, without previous reference being made to us, engaging to support such reference with your recommendation.

81. In a subsequent address from the Society, dated 10th July 1837, you were solicited, pending the result of the reference to us, to assist the Society with a monthly grant of 200 rupees, and a further sum of 800 rupees, a month, for the purchase of additions to the Library and Museum, on the condition that if the disbursement should be disapproved of, the articles so purchased should be relinquished to the Government. With the first of these requests you complied, but declined to make any specific appropriation of funds for the objects proposed in the latter suggestion, although you stated your willingness to receive from the Society recommendations for the purchase, or other procurement, of such articles as the Society might think it desirable to possess, and provided they were not of a perishable description

85. The independent and useful activity of the Asiatic Society of Bengal during so long a period, entitles it justly to your consideration, and looking to it as the only institution in India, which offers any analogy to the great national libraries and museums of Europe, it is a legitimate object of public support. We therefore approve of the aid and encouragement which you have given. We think, however, that the extent to which you have gone is fully adequate to all purposes of public utility. The Society is already in possession of a library and museum of some extent, and the additions that may be made to either must be occasional and progressive. It does not happen in India as in Europe, that large public or private collections of a rare and valuable description are offered for sale, and all accessions which the Society will have an opportunity of acquiring must be of limited extent and incidental occurrence. From the character too of the persons who are likely to contribute to the Society's collections, it is very improbable that a pecuniary equivalent will in all cases be desired, and it seems to us, on various grounds, unnecessary and objectionable to assign to the Society a permanent grant for the purpose of effecting occasional purchases. When an application from the Society comes before you for any definite outlay, it will be time enough to take into consideration the expediency of granting the particular assistance that may then be required. We shall not object to your granting to the Society funds for special purchases, as occasions arise, as far as may be compatible with a due regard to public economy. On all such occasions, you will forward to our Museum a selection from the articles which may have been so procured.

86. The more immediate and permanent want of the Society is the superintendence of a qualified person to preserve its collections, and arrange them in a scientific and systematic manner, so that they may be readily consulted, and be at all times subservient to the diffusion of useful knowledge; such a person may no doubt be met with at the Presidency, and we do not object to your allowing to the Society the monthly sum of 200 or 250 rupees as the salary for his services, with a further sum of 50 rupees a month for the cost of preparing specimens, and maintaining the

collections in order. It would however be an unprofitable waste of money to attempt the preservation of many of the objects of natural history in the climate of Bengal, and these when considered valuable should be transmitted to our Museum.

87. We do not object to the retrospective effect given to the appropriation of 500 rupees a month for the publication of oriental books, under the circumstances stated; and we take this opportunity of intimating our wish, that as soon as the work in hand shall have been completed, arrangements should be adopted for applying the grant to the printing of the text of the Vedas, with a commentary, as the oldest and most authentic record of the language and religion of the Hindus, and therefore indispensable to the history of opinion and of man

(True Extract)

H. T. PRINSEP,

*Secretary to the Government of India.*

*Minute by Sir EDWARD RYAN.*

It appears from the copy of the dispatch of the Court of Directors, communicated to the Society by the direction of Government, that 200 or 250 rupees are to be allowed monthly to the Society for the salary of a qualified person to preserve its collections, and arrange them in a scientific and systematic manner, and an additional 50 rupees a month for the cost of preparing specimens, and maintaining the collections in order. I think it is desirable that the Society should state the time they will require any Curator they may appoint to devote to his charge, and the periods at which he should report to the Society upon the state and condition of their Museum. I think upon the fixed salary that will now be devoted to the person, that the Society might reasonably expect two or three hours in each day shall be devoted to the Museum—that reports should be made at each monthly Meeting—and the office of Curator should be held, like most of the offices of the Societies, for the year only: that is, subject to annual re-election. If the Society approves of the conditions there named, I would further propose, that the office of Curator be offered, in the first instance, to Dr. M'CLELLAND, who has so kindly, for some time past, discharged the duties of Curator without salary. If he will accept, the office, I am sure the Society will be happy to avail itself of his most valuable services. I beg our Secretary to circulate with Mr. Secretary Prinsep's letter and enclosure this memorandum.

EDWARD RYAN.

*January 25th 1840.*

*Circular from officiating Secretary, to the Committee of Papers, Asiatic Society.*

GENTLEMEN,

I beg leave to circulate an important dispatch from the Honorable the Court of Directors, regarding our Museum, and directing a salary of 250 rupees per mensem to be paid to the Curator. I also circulate a Minute on the subject by our President.

I take the liberty of expressing my concurrence in the opinions of the President, and at the same time my hope, that Dr. M'CLELLAND may be enabled to command sufficient leisure for the duties of the office. It is quite impossible at present to find a competent and available individual to fill Dr. M'CLELLAND's place. The accomplished officers who have recently entered the service (I allude chiefly to Drs. WALKER, JAMESON, and CANTOR) are too eagerly sought for by the Government for scientific missionary duties to justify our indulging the least hope of their being soon placed in Calcutta.

I am satisfied, at the same time, that should Dr. M'CLELLAND feel his time pre-occupied to such an extent as to prevent his attending closely to the Museum, he would be the first to propose measures for the securing the entire services of a competent person. I think with the good salary we are now enabled to offer, that we can very easily procure such an individual from England. I accordingly propose,—

1. That in the event of Dr. M'CLELLAND declining the curatorship on the terms allowed by the Honorable Court, and under the stipulations of our President, the Committee of Papers address (through the President) an application to the proper scientific personages at home, requesting their selection and appointment of a competent naturalist for the office of Curator on a salary of 300*l.* per annum.

2. That the Committee of Papers at the same time forward a memorandum of the Curator's duties.

3. That the person appointed in England be bound to serve the Society for five years.

4. That an outfit allowance of five hundred rupees be allowed him, and his passage paid for, and that the necessary funds for these expenses be provided by allowing the Honorable Court's monthly donations to accumulate from the date on which these resolutions may be agreed to, until the arrival of the Curator.

5. Lastly, that these resolutions be submitted to the consideration of the next general meeting, with the recommendation of the Committee in their favor.

Your's faithfully,

26th January, 1840.

W. B. O'SHAUGHNESSY

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*Minute by Dr. M'CLELLAND.*

Having fully considered the responsibilities of the office of Curator, I shall be happy to continue to discharge its duties, if it be desirable to the Society I should do so.

As the Museum of Natural History at the India House is alluded to in the Court's dispatch, I take the liberty of putting into the circular a letter from Dr. HORSFIELD, the superintendent of that collection, by which it will be seen that the Court of Directors are promoting at the India House the very same object that we have here in view, in endeavouring to establish a collection of natural objects.

Under these circumstances, it will no doubt be agreeable both to the objects and wishes of the Asiatic Society, to promote as much as possible, without detriment to our own Museum, the objects of the home collection, with which view the grant of 200 to 250 rupees as salary to a Curator, seems partly to have been made.

In my opinion the great, and indeed the only security the Society can possess in regard to a Curator, is scientific reputation; for without acquirements of a high order as a naturalist, (by which I do not mean a stuffer, nor the mere namer of objects) his assiduity would be of no avail, while his monthly reports, were he to engage to supply them, might bring discredit on the Society.

It is for these reasons, and because of a want of confidence in my fitness for an office so interesting and important as our curatorship is now likely to become, that I cannot enter into any engagements as to periodical reports, or hours of attendance.

We may at present have few in Calcutta qualified for the office, but of the number of eminently qualified individuals who have recently entered the Medical Department, we may hope that ere long the services of some of them will be required in Calcutta,

when our Museum will have the aid of curators of far higher qualifications than the Society could obtain from Europe for any small sum we can ever hope to be able to offer.

29th January, 1840.

J. M'CLELLAND.

P S.—I was afraid that in sending home for a Curator it might be forgotten that we have eminently qualified persons in India, and am therefore the better pleased to find that since my remarks were circulated, the names of three to whom I particularly alluded, have been incorporated in the Secretary's Minute. I am however, very sanguine as to soon seeing several qualified scientific men in Calcutta, for offices of this nature

J. M'CLELLAND.

*Minute by Mr. H. T. PRINSEP.*

I wish to see this question fairly discussed at the meeting on Wednesday next. I see no other arrangement that can be proposed, except to place Dr. M'CLELLAND in the office for the coming year; but I think unless he will pledge himself to daily attendance, and monthly reports, that he should be considered, as he himself suggests, as officiating until we can find a qualified person who will give more time to it

I think with him, that it will be preferable to look out for a Curator amongst the highly qualified persons we have in India, rather than take the chance of obtaining a good man from England. 300*l.* per annum, or 250 per mensem, is not enough to satisfy a man of science. Indents for Editors, and even for Schoolmasters, from Europe have not ordinarily been successful.

H. T. PRINSEP,  
D. STEWART,  
W. N. FORBES,  
D. McLEOD.

30th January, 1840.

*On the day of the meeting Dr. M'CLELLAND submitted the following additional Minute.*

As the Museum at the India House is alluded to in the dispatch of the Honorable the Court of Directors, No. 17 of 1839, dated the 18th September, the following remarks on that collection is extracted from a private letter addressed by Dr. HORSFIELD to Mr. M'CLELLAND, Bengal Medical Service, dated Library, East India House, August 31st, 1839.

"The Museum itself is not very extensive, but it is nevertheless of much importance in connexion with Indian zoology, as it contains several extensive local collections

"It consists mainly of the following Faunas, which are more or less perfect:—

"*Firstly.* A collection of upwards of 200 species of birds from Java, and a proportional number of quadrupeds. This was formed by myself, and brought to England in 1819, when it constituted the nucleus of our Zoological collection.

"*Secondly.* We have a pretty complete series of Birds collected in Sumatra by Sir STAMFORD RAFFLES, and some of his Mammalia.

"*Thirdly.* We have a similar collection made by the late Dr. FINLAYSON in Siam and in the Indian Archipelago.

"*Fourthly.* We have a nearly complete series of Mammalia and Birds collected by Colonel SYKES, in the Dekun, of the importance, and extent of which you can judge by the respective catalogues contained in the Proceedings of the Zoological Society for 1831 and 1832.

"*Fifthly.* We have a few specimens from China, Nepal, and the Upper Provinces of Bengal, but these are imperfect and fragmentary.

"To these has now been added a series, almost complete, of the Mammalia and Birds collected by yourself in Assam, which have been mounted, and form a valuable addition to the specimens exhibited in our Museum.

"All these separate Faunas are neatly arranged in our natural history department, which consists of a large room well lighted, and provided with excellent cabinets for the preservation of the subjects.

"This Museum I may say is established on a modest scale, and without the pretension to extent or elegance of the national collections (such as the British or Hunterian, or even the Zoological Societies) but our specimens are generally good, being prepared by the best London artists, and my endeavour is to have them correctly labelled.

"Our collection consists mainly of Quadrupeds and Birds; but we have also a small collection of Fishes, Reptiles, and Serpents, which have recently been examined by Dr. CANTOR, who has prepared a list of them, agreeably to which they are arranged.

"It is my intention as soon as possible to prepare a general list of the Mammalia and Birds which are arranged in our Museum for transmission to you, so that you may form an accurate idea of what we have, and be enabled to judge of what we want.

"I have no doubt the nature and importance of natural history is more considered and appreciated now, than it was in former times; and I cherish the hope that the countenance and support of Government will ere long be extended to it in an effectual way; but this I can at present only allude to as a wish or expectation. Meanwhile I may enumerate some of the subjects which would be particularly desirable. We want, for instance, many of the birds of Bengal. All the rarer species, and some of the more common (of these I hope soon to send you a provisional list); we want generally the Birds of Silhet, the Garo Hills, Tenasserim, Arracan, Burmah, &c. &c. and duplicates of the new and of all the rarer species discovered by you in Assam.

"We want a complete series of the Birds of Nepal, also Mammalia; the smaller species would suit our purpose best, as we can more easily accommodate them. But above all, and especially, we want a large, full, and complete collection of all the *Vespertilionidae*, or *Bats* of India. This is the most important family, as it has never been sought after; and I beg and entreat you to have a large collection made generally throughout all India; and I need not point out to you the localities where these animals are most likely to be met with."

Here Dr. HORSFIELD enters into particulars regarding the genera and species.

"But besides these it is in the branch of *Entomology* that I would at present strongly solicit contributions to the Company's Museum. I am more anxious on this head, as I have succeeded in bringing an extensive collection of Insects from Java in excellent condition, and with the exception of these, and the collection of Colonel SYKES, we have absolutely nothing from Bengal or from India generally." On this subject Dr. HORSFIELD delicately alludes to the probability of gentlemen connected with



missions still holding collections of Insects unappropriated, under the supposition, perhaps, that such objects would be less appreciated than the large animals; on the contrary, Dr. HORSFIELD states that contributions to this department of the Museum would be as like'y as any other means to promote the interests of science, and to secure the approval of those who are interested in the collection at the India House.

With regard to Insects. The public collections which remain, I believe, unappropriated, are those made by Dr. WALLICH, Mr. GRIFFITH, and myself, when employed on the Assam deputation, and Dr. HELFER's collection. That which was made by the Assam deputation is still, I believe, at the Botanic Garden, and like Dr. HELFER's collection has not yet been transferred to the Government. With regard to the former, perhaps the Society has no authority to interfere; but as the Society has been authorized to take one series of Dr. HELFER's collection for our own Museum, and to select another for that of the India House, it might be necessary to address Dr. HELFER on the subject, particularly as his collection of birds for the Honorable Court has been packed up for some time in the Museum, and are only detained till the insects which have not yet been submitted to the Society should accompany them.

The large collections of birds and insects made by Captain PEMBERTON during his mission to Boutan, and the officers who accompanied him on that occasion, have been long almost unobserved in the Museum, owing to the late repairs of the house. The greater part of the birds composing that collection were previously in our possession, but such as were new to it were transferred to our cabinets, and the rest enclosed in cases for transmission to the India House. The insects of the same collection which are numerous, and no doubt rich in undescribed forms, are also in course of being dispatched with the birds; a series having been reserved for our own collection. The pains taken during Captain PEMBERTON's Journey, to mark the localities in which the different objects were collected, cannot be too highly applauded, especially as this very important circumstance has been hitherto altogether neglected on such occasions.

Mr. LYELL in a letter addressed to Mr. M'CLELLAND, dated 7th September 1839, states, that he is very anxious for accurate information respecting the geography of living *testacea* and Indian *tertiary* shells, and if furnished with duplicates from the Museum of the Asiatic Society, proposes in return to supply the Society with fossil and recent shells in exchange.

The Society, it is to be regretted, has few fossil shells from Indian beds, and a very imperfect collection of recent species. Indeed the little attention that has been paid to these important subjects in India, seems to have induced collectors to send their contributions elsewhere. Several members, and others interested in the advancement of science, are most favourably placed on the Malay coast, at various points from Chittagong to Mergui, and we may look, I trust, with confidence for large collections from this quarter in the peculiar department alluded to. I have myself been already indebted for a miscellaneous collection of shells from Dr. HELFER, and slight contributions have been made to our Museum from time to time by different individuals; but I question if we have as yet a tenth part of the species of the Bay, while we are altogether without the corals, polypes, and radiata, so abundant in all the Eastern seas.

Mr. A. P. PHAYRE, assistant to the commissioner of Arracan, kindly sent me some time since a few interesting specimens of the rocks in the vicinity of Akyab, which are perforated to the height of six feet above the greatest elevation of spring tides, the same as beneath the level of the water, by a species of *Pholas*. Mr. PHAYRE justly

ascribes this to a change of level in the rocks composing this part of the coast, and regards the perforations as identical to those which have been observed in the sandstone at Cherra Ponji. With regard to the Cherra Ponji rocks, I am indebted to Mr. H. WALKER for an observation of very great importance when observing the number of *Echinida* in my collection from that quarter; he suggested the probability of the elongated moulds contained in what seemed to be perforations, being nothing more than the spines of a *Cidaris*, a species of *Echinus*. On this subject, as well as the *Echinida* generally, which I find to be very abundant in the Cherra beds, I hope soon to have a communication to make, being now employed in an examination of the Indian species, particularly those which I have found fossil.

These departments of the animal kingdom are of the more importance to our collections, as we can hardly advance a single step in geology until our cabinets are complete, or nearly so, in recent species.

Mr. PHAYRE has liberally undertaken to collect for us at Akyab, but we require equally zealous correspondents at Chittagong, Kyuk Phyu, Sandoway, Moulmein, Mergue, and at all the different stations along the coast, before our Museum can be considered in a progressive state.

With regard to fossil species, our collection is equally defective; indeed so long as we are without a complete collection of recent shells, fossil species would be of little interest in our Museum. As a proof of the poverty of our collection, I may remark, that of one striking and numerous family, affording probably some hundred species, most of them found in the Indian seas, yet *two* species only are all we have in our Museum, and these from unknown localities, probably New South Wales.

As animals of this family have been found in a fossil state, in a bed of sand, reposing beneath the common soil of the Sylhet mountains, under circumstances which we are bound to investigate, the fact may induce those who reside along the coasts above alluded to, to contribute their share towards the inquiry by forwarding specimens of them to our Museum. The dried testa of *Echinida*, called *sea-eggs*, are very abundant, I understand from Captain BROWN, on the shores of Rambree Island, and all the islands from thence to the Straits, while the living animals usually named *sea-hedge-hogs*, from the number of spines with which they are covered, may be had from rocks in the same vicinity. The bleacher shell is seldom perfect, so that the living animals when put fresh into spirits form the more valuable specimens; but from the ease with which the former may be collected and preserved, as well as from their beauty as mere ornaments, they ought to form a portion of every collection, and from the philosophical interest of the subject they would be a welcome addition to our Museum.

Enough I trust has been said to induce residents on the Malay coast and other situations where similar facilities are afforded, to enable the Society to avail itself of the offer of Mr. LYELL, and at the same time to enlarge, or rather form its own collections of Indian species.

The interest now awakening in Europe regarding the natural history of this country, is calculated to produce a more powerful effect in exciting a spirit of inquiry here, than any arguments that could be urged on the spot. Thus, we have not only a Museum at the India House, now opened for the exhibitions of animals collected in India, but the first philosophers are ready to co-operate with us and aid our inquiries.

In addition to the instances of this kind already referred to, Mr. E. CHARLES-WORTH and Mr. S. V. WOOD have each presented us with collections of tertiary shells,

to facilitate our examination of the Cherra fossils. With a similar view Professor REINHARDT has presented the Society (through the medium of Dr. CANTOR, by whom they have been safely conveyed from Denmark to our Museum free of expense) with the valuable collection of skulls of *Cetacea* from Greenland, now on the table, to facilitate the examination of the fossil Mammalia that abound in several districts of India.

We cannot however flatter ourselves that any results we have yet attained are such as to entitle us to the aid of naturalists in Europe. I therefore refer the interest which the above marks of attention betoken in favor of our scientific movements, to the personal influence of one of our members, Dr. CANTOR, who has recently returned from Europe, where he met a reception for his labors among us, from philosophers of every rank, of which he may well be proud, and which cannot fail to produce a powerful effect on his future career in India.

Our scientific progress will however depend so much on the cultivation of a general intercourse with scientific individuals and Societies in other parts of the world, that we ought to take advantage of the occasion by meeting the views of those who are desirous of exchanging collections with us.

Indeed to attempt to establish a national Museum in India without this kind of co-operation, would be to reject what has been done in Europe, and to begin the study of the physical sciences as if nothing had been accomplished beyond the few scattered publications that reach India. It is by cultivating an interchange with other Museums, and thus introducing the known species of other countries as the standard of comparison for the elucidation of the unknown species of this, that we are to advance our own collections, and contribute most effectually to the general diffusion of knowledge, and the progress of science.

5th February, 1840.

J M'CLELLAND.

Dr. M'CLELLAND then rose and addressed the meeting regarding the attendance of the curator for two hours a day, and a monthly report on the Museum, as insisted upon in the minute of the President, which he objected to. He objected to any stipulated period of daily attendance beyond what might be necessary to superintend the persons employed in the Museum, and of this the curator himself should be supposed the best judge. He has been in the habit of devoting more time than two hours, he might say even five hours, daily to the duties of the Museum, but that was at his own house, where he had painters and other facilities which the Museum did not afford, and where he would continue to employ himself pretty much in the same way whether appointed curator or not. As to reports, he also thought these should be left to the discretion of the curator, as it would be useless reporting unless there should happen to be something of interest to report about.

SIR EDWARD RYAN said, that he thought Dr. M'CLELLAND did not quite understand him by two hours a day; he did not mean that two hours should be given every day, but that if he could not give one, four hours could be devoted to it the next, and so on, only that on an average two hours daily, whether at home or at the Museum, should be required by the Society from the curator.

As to monthly reports, it was not absolutely necessary that a long report should be furnished every month; for some months there might not be any thing to report, when only a letter stating this circumstance would be all that would be required. Monthly reports were only necessary as public records for future reference for a history of the Museum, and also that they might have something which they could produce if called

on by the Government for the expenditure of the sum granted by the Honorable Court for this express purpose. He therefore begged to propose that the office be offered to Dr. M'CLELLAND on these stipulations, if he chose to accept of it.

Mr. H. T. PRINSEP thought it necessary to inquire, with reference to Dr. M'CLELLAND's explanation of his views of the nature of a curator's office, whether it was intended to recognize the curator as entitled to remove to his own house any objects of natural curiosity or other articles he might desire. He thought that the recognition of such a privilege was inconsistent with the object of preserving always at hand for inspection every article obtained. He wished the rules of other Museums should be referred to, for of course it would be expected now that the Honorable Court had specifically assigned a sum for its maintenance, that the Society should conform to the practice of other similar institutions in Europe. Of course on the first arrival of any article, before it was classed and located in the Museum, the curator might do whatever was necessary to examine and test it, carrying it away if he pleased for the purpose. But when once placed in the Museum, Mr. PRINSEP thought the articles ought not on any account to be removed, and the rooms of the Society afforded facilities sufficient for copying and comparing in them, without any removal being necessary.

Sir E. RYAN then moved that the Committee of Papers be instructed to draw up rules on which the curatorship should be held, with the stipulation that two hours a day at least be allotted for the duties of the office—that reports be furnished monthly of the state of the Museum—and that no specimens be allowed to be removed from the Society's apartments. Similar rules in fact have invariably been observed by other Societies. The President further suggested, that the Committee do make their report on it at the next meeting. Dr. M'CLELLAND then said, that if it was intended that these rules should be strictly enforced, it would be the means of greatly limiting the endeavours of the curator, whoever he might be, for the interests of the Society; and he thought it as well, under these stipulations, to decline accepting of the situation.

Sir E. RYAN added that the Society were so sensible of the value of Dr. M'CLELLAND's services, that no decision would be formed on his expressed refusal of the office until the next meeting

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The annual Report was then presented by the officiating Secretaries, but reserved for perusal at the next meeting.

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The following letters from Dr. CANTOR were read.

SIR,

*Calcutta, January 25, 1840.*

I take the liberty to call your attention to the following extract of a letter which I have received from Prof. REINHARDT, Superintendent of the Royal Museum at Copenhagen.

"In the year 1823 or 1824, I presented a number of stuffed specimens of European, (mostly northern) birds to the Asiatic Society, Calcutta. From a Calcutta Journal I have learned, that the specimens had arrived in fine condition, and that the Society at their monthly meeting were pleased to pass a resolution, that a number of their duplicates of Indian birds were to be presented to me in return. I have however since then neither heard any thing concerning this matter, nor have I received the gift of the Society. If you therefore on your return to Calcutta could procure some informa-

tion as to what course has been pursued after the Society had passed the resolution, I shall feel much obliged " \*

I beg leave to request that you will favour me with such information upon the subject as shall enable me to comply with the request of Professor REINHARDT.

I have the honor to be, Sir,

Your most obedient servant,

THEODORE CANTOR.

To the Curator. Asiatic Society's Museum.

SIR,

Calcutta, January 25, 1840.

In a letter from the Secretary, bearing the date of October 31st, 1837, Mr. JAS. PRINSEP expressed the Society's wish, that on my arrival in England I should purchase such works upon natural history for the Society as were most wanted in their library. To the number of works upon natural history which I have ordered Messrs. ALLEN and Co. to procure and dispatch to the Society, I beg to add the accompanying work upon *Infusoria*, by Professor EHRENBURG.

In the above mentioned letter, the Secretary further requested me to take charge of two duplicates from the Society's Museum, viz. a skull of an elephant, and a ditto of a rhinoceros, with a view to procure in exchange for those objects others, which from the knowledge I had obtained by arranging and making a catalogue of the Museum, I should conceive to be acceptable.

From Professor REINHARDT, Superintendent of the Royal Museum at Copenhagen, I have received in exchange the accompanying series of osteological preparations, which with the annexed list I have the honor of laying before the Society. The collection consists chiefly of northern Cetacea, a class of animals, which, from their locality, belong to the rarer objects in the European Museums, and which I conceive of double interest to our Museum, as affording means of comparison to students of the fossil Cetacea found in the Himalayan beds.

I have the honor to be, Sir,

Your most obedient servant,

THEODORE CANTOR.

*List of osteological preparations received from the Royal Museum at Copenhagen, in exchange for two skulls from the Asiatic Society's Museum.*

- |     |    |                                    |
|-----|----|------------------------------------|
| No. | 1. | Canis lagopus,                     |
| "   | 2. | Ursus maritimus,                   |
| "   | 3. | Phoca hispida ♂ Adult,             |
| "   | 4. | Phoca groenlandica ♂ Old,          |
| "   | 5. | Ditto .... ♀ Adult,                |
| "   | 6. | Phoca vitulina ♂ Old,              |
| "   | 7. | Ditto .... ♂ Young,                |
| "   | 8. | Phoca barbata ♀ Adult,             |
| "   | 9. | Cystiphora (Phoca) cristata ♂ Old, |

\* Note by the Curator. The articles intended by the Society for Professor Reinhardt were made over to Dr. Wallich, I believe, who undertook to have them conveyed to Copenhagen.

- „ 10. Ditto .... ♀ Old,  
 „ 11. Ditto .... ♂ Young,  
 „ 12. Ditto .... (6 months old.)  
 „ 13. *Trichechus rosamarus*. Adult,  
 „ 14. Ditto .... Young,  
 „ 15. *Delphinus phocæna*, Adult,  
 „ 16. Ditto .... Young  
 „ 17. *Delphinus globiceps*. Old,  
 „ 18. *Delphinus (Delphinopterus) albicans*.

The specimens were procured in Greenland.

THEODORE CANTOR.

*To the Curator, Asiatic Society's Museum.*

*We have been obliged to forego our intention of publishing COLONEL LUARD'S admirable sketch of the explosion of the "Equitable," it being quite impossible in Calcutta to communicate its effect by a stone drawing.—EDS.*



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ART. I.—*Third Report on Tenasserim—the surrounding Nations, —Inhabitants, Natives and Foreigners—Character, Morals and Religion.*—By JOHN WILLIAM HELFER, M. D.

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*Position of the Tenasserim Provinces.*—The Tenasserim Provinces, excepting the Malay countries of Province Wellesley, Malacca, and Singapore, are the only isolated British possessions in India.

They are surrounded by the bay of Bengal, (hitherto the only road of communication), and by foreign states. The river Salween divides them from the Burmese kingdom of Pegu towards the north-west; the river Thounyee from the Shan states of Zimmay, Laboung, and Yaihaing towards the north; the range of mountains running from north to south through the whole Malay peninsula from the kingdom of Siam to the east; the river Packchan from the Siam-Malay states to the south; the bay of Bengal and the Nicobar and Andaman islands front their west side.

*Surrounding nations.*—The nations which encircle the provinces are, therefore, the two rival nations of Burmah and Siam, possessing a tolerably consolidated, established, and regulated government, the tributary and dependent Siam-Malays, and the Burmah Shans, the half savage Nicobarians, and the Andamanese cannibals.

*The Burmese possessions incorporated with British India.*—The Tenasserim Provinces have been incorporated with the British empire in the east, in consequence of the war with Burmah in 1824-25. For the purpose of weakening that insolent and ignorant power, Assam, Arracan, and the Tenasserim Provinces were wrested from it.



*Extent of Tenasserim.*—The Tenasserim Provinces consist of a part of Martaban (now Province Amherst, formerly belonging to Pegu) and the districts of Ye, Tavoy, Mergui, and Tenasserim.

*Motives for occupying Tenasserim.*—There seems to have been no secondary motive for retaining these provinces, beyond their affording facilities to command the bay of Bengal; they could not have then held out any other apparent, known allurements.

*Present relations with Burmah.*—The misapplied generosity of the British, left their Burmah foes in possession of the most productive and important part of the empire. This generosity has been misconstrued into weakness, or inability to retain the conquest; which prevailing opinion has acquired greater strength since the usurpation of the present ruler, and this opinion, strengthened by the peaceable policy of the British Indian Government in this quarter, is the reason of the insolence of the present ruler of Burmah.

*Formerly prevailing opinion of the Burmah power.*—Formerly when all intercourse with Burmah was either cut off entirely to Europeans, or when the notices of the embassies of the British government sent to Ava could be but imperfect, on account of their always proceeding the same way by water, up the Irrawaddy to the capital, the power and population, the resources and abilities of this empire were greatly exaggerated.

*Now corrected.*—Since that time, our knowledge of it has greatly increased; the war laid the lower country open to investigation; and since the conclusion of the treaty of Yandaboo, several able British gentlemen have traversed the empire in different directions, and the conclusion drawn from personal experience has been, that Burmah could only rank in political importance with second rate Indian powers. It was found out, that the population formerly estimated at 17 millions of inhabitants, could not be reckoned at more than 3 or 4 millions scattered over a wide extent of country—that part of the population was tributary to the ruler—that, if that prince, be inclined to hostilities, he can but raise a kind of temporary militia, not exceeding at the utmost, 70 or 80,000 men—that a permanent disciplined soldiery does not exist—that great part of this militia must be in a sad plight after a few months' campaign; placed opposite a disciplined army, commanded by Europeans, on account of want of ammunition, clothing, food, &c. &c.—that most of these men are peasants, driven from their homes by force to fight the enemy—that few of them know even to handle their arms—and that none of them are able to fight a British Indian army in the open field.

*Erroneous opinions of the people.*—In the same manner in which the abilities of the ruling power were misrepresented, an erroneous opinion was also formed of the character of the inhabitants.

*Equally corrected.*—Instead of finding the mass of the population *brute warriors*, they are in fact a harmless, naturally mild race of husbandmen, oppressed by a highly tyrannical absolutism.

*Reasons of their military excursions.*—The love of sudden gain, and that (to every nation) inordinate desire after adventures, carried them, under the lead of ambitious men in power, from time to time to invasions of surrounding states, and rendered them chiefly under the founder of the present dynasty, Alompra, in the last century, a conquering nation. Yet they were destitute of the roaming ferocity of the Tartars, or the bloody propensity of the Arabs, and of the personal courage of both. The mass engaged in such expeditions, after a few months devastation and plundering, returned to their homes to labour in the fields; and a small part of them continued robbers even in their own country, often not discouraged by their own government, perhaps, with a view of conserving in them the stock and spirit of soldiery, useful for future enterprizes.

*An exaggerated military reputation.*—The dread of surrounding, unsettled, petty nations, the never decided superiority between them and the Siamese, their succeeding even in defeating a Chinese army, nurtured in them a persuasion of their invincibility; the boasting of their blinded adulating courtiers, the ignorance of the true state of the country—a *terra incognita* to Europeans—all this contributed to create a high opinion of their power, and consequently an erroneous belief of danger to British India, until their own signal defeat in the last war, followed by the first dismemberment of their empire, destroyed this delusion.

*Other neighbours.*—*Shans.*—The neighbours to the north, the tributary Shan states of Zimmay, Laboung, and Yaihaing, are equally an agricultural race of people, the nature of their mountainous sub-alpine country induces them also to partly follow the pursuits of pastoral tribes. They appear to be weak clans, and profess to detest the Burmese, but are too insignificant to become independent; they have hitherto manifested a spirit of amity towards the British, and have shewn themselves anxious to be allowed to throw themselves under their protection.

*Siamese.*—The kingdom of Siam, fronting the Tenasserim provinces towards the east, is established upon the same foundations which are in these parts universally acknowledged and adopted. The government

is likewise an uncontrolled, sometimes very rigorous, absolutism; yet it appears Siam is advanced one step farther in civilization than Burmah, for its ruler not only protects agriculture, but encourages commerce; its inhabitants are undoubtedly more industrious, and in consequence, their country more wealthy. The fertility of the great valley and of the plains formed by the delta of the Meram river, is highly spoken of. The great number of Chinese settled amongst them has doubtless contributed to establish a more general and improved cultivation. The custom prevailing to this day of driving the population of whole districts, when conquered, to remote parts; forcing them to cultivate the ground, though in itself for the depopulated countries highly pernicious, seems to indicate that the government knows duly to appreciate the value of the labour of husbandmen. Though no positive data of the whole amount of the revenue are known, yet it must be, judging only from the duties levied at Bankouk, at least double that of the Burman empire.

The feelings of the court of Bankouk, manifested towards the British Government of India, have been hitherto those of amity and good-will. These feelings are dictated partly by apprehension for their own safety, partly by their hereditary enmity towards the Burmese; they viewing the British as the natural enemies of that nation. The Burmese and Siamese have been for a long time rivals, and in consequence, never friends. The weakening the Burmese gave additional strength to the Siamese. Before the British war with Burmah, neither of the two powers, though almost uninterruptedly engaged in petty warfare, could subdue the other; their military force and prowess being equal.

Their mode of warfare was confined in latter times to temporary invasions, accompanied by mutual devastations, generally to both parties equally injurious. The consequence was, that the confines of the two powers have been rendered a waste, and hence it is accounted for that the frontiers of the Tenasserim provinces towards Siam are totally uninhabited, desolate, uninterrupted forests, from thirty to eighty miles in breadth.

It appears from the late accounts of Dr. Richardson, that the high opinion which the court of Bankouk had conceived of the British power, and which they knew only to measure by the progress of British arms in the last war, has somewhat diminished, within the last two years. With the returning belief of their own strength, and diminishing apprehension of their new neighbours, the feelings of amity, and the desire of mutual peace, will be lessened.

*The Siam-Malays.*—The Siamese are conquerors in the Malay peninsula. The petty states to the south of the Tenasserim provinces (whose boundary is formed by the Pakchan river disembodying in lat.  $9^{\circ} 57'$ ) are under Siamese dominion. The races inhabiting it are mixed. Those in the neighbourhood of the Tenasserim provinces are either Siamese, or formerly captured Burmese, or people from the eastern frontier of Siam, besides others forcibly transplanted from other parts. The people lower down the peninsula are half Siamese and half Malays; and nearer to the extremity of the peninsula, of pure Malay origin. It seems that the Siamese government exercises in these provinces a much more severe absolutism than within the proper limits of Siam, and consequently it is proportionably more hated.

*Malays.*—The Tenasserim provinces have no intermediate intercourse with the Malays, except with some few people of this race, who have farmed the edible birds' nest caves in the Mergui archipelago, from government.

*Nicobarians.*—The people of the Nicobars, apparently the offspring of a mixture of surrounding nations, wrecked or dispersed accidentally on the islands, are totally insignificant in a political point of view.

There exist some relations between the Burmese of the Tenasserim provinces and these islanders, with whom a trade of exchange is carried on. The Nicobarians furnish ship loads of cocoanuts which they barter with the Burmese for cloth, tobacco, iron, and earthenware. They must be called independent at present, for though the Danes endeavoured repeatedly to take possession of some of the islands, at present not a vestige is to be found either of their establishment or of their authority.

*Andamanese.*—To finish the enumeration of the nations bordering on the Tenasserim provinces, mention must be made of the Andamanese, perhaps the lowest beings in the scale of civilization belonging to the human species. They are of the negro variety with woolly curly hair, of a diminutive stature, almost untameable, even when caught young, living upon trees, or under a shed of peeled bark, or in the crevices of mountains, subsisting upon the spontaneous produce of nature; their chief food consists of shell-fish, collected on the sea-shore. They are reported to be cannibals. No nation has yet succeeded in forming a friendly alliance with them, they considering every stranger an enemy, whom if it be practicable they kill, and in retaliation are destroyed by every stranger without compunction, whenever accident brings them in contact.

The interior of these large and interesting islands is entirely unexplored. The sea-shore is visited by the Burmese inhabitants of Tenasserim and the Malays, for the purpose of collecting sea-slugs, and edible birds' nests. These occasional visitors have no intercourse with the savage inhabitants, and live during the season of collection either in their boats, or build a sort of temporary stockade for their defence.

Notwithstanding the favourable situation of these islands in the bay of Bengal, notwithstanding the beautiful harbour of Port Cornwallis, the attempt to form an establishment there, made several times by the English for the sake of a military and commercial dépôt, has been given up entirely.

*The Dutch.*—The Dutch is the only European power which has possessions in the post-Asiatic countries, besides the British (if the Philippine islands be excepted.) However not only their vicinity, but even their very existence is unknown to the people of Tenasserim; there is no intercourse, no communication whatever with their ports, and I believe that not a Dutch vessel has even approached the coast of the territory since its occupation by the British.

*The French.*—Some old inhabitants remember the French. In the last war, their fleets had for a time their station in King's Island Bay, for the purpose of intercepting the Indiamen trading to China, and their rendezvous place, as well as the rivulet from whence they supplied their ships with water, were pointed out to me by the Burmese. The French however never ventured upon an inland excursion, and the inhabitants then having scarcely any notion of the existence of Englishmen, could of course have no suspicion of the relations which existed between the two nations.

*Intercourse with the Chinese.*—Though a number of Chinese are settled in the provinces as merchants, yet there is no intercourse directly with China either by land or water. A caravan from the Chinese province of Yunan approached last year within fifteen to twenty days' march from Maulmain, and intended to penetrate as far as that settlement, for the purpose of trading; however, jealousy, and apprehension in general, as well as the then already manifest inimical intentions of the Burmese usurper, prevented those enterprising men from accomplishing their purpose. A considerable loss to them it is said was the consequence, and probably no other attempt will be made on their part, until the relations with the petty states to the north, through whose territories the Chinese have to pass, are based upon a more secure and solid foundation.

*The different nations and tribes inhabiting the Tenasserim Pro-*

*vinces. Constant changes in Indo-China.*—The stability of China Proper and Japan for so many centuries, forms a remarkable contrast to the constant and total changes which have happened in the adjoining countries comprised under the name of Indo-China, the constituent parts of which, are Cochin-China, Tonkin, Cambogia, Anjam or Loas, Siam, and Burmah. One race of people destroyed the other, and was again expelled and supplanted like the former, by subsequent conquerors. The kingdoms just mentioned as they exist at present, are erected upon the ruin of vanquished nations, whose history even, is frequently lost.

*Alompra's Empire.*—The territories of the Burmese empire had the same fate; and the present dynasty of Burmah is but of recent origin. Alompra, assisted by favourable circumstances, after many struggles, bloodshed, and devastation, finally overthrew Pegu, and established a new kingdom at Amarapooa, carrying from thence his victorious arms over a wide extent of country.

*History of Tenasserim.*—The history of the Tenasserim provinces is involved in darkness. Who the first inhabitants were can scarcely even be guessed at, for it is not known who the inhabitants were four centuries ago. To judge from the Kareans inhabiting the interior, who seem to have outlived all revolutions of the successive conquests, and following analogy, whatever inhabitants there were they seem to have belonged to Mongolic races. Burmah as well as Siam and Cambogia, seem to have been originally peopled from the north, and it is very improbable that the inhabitants of Tenasserim were ever mixed with Malay blood. The comparatively late arrival of that race from Menamcaboo in Sumatra, in the Malay peninsula, in the districts of Jabor, Malacca, and Queda, where they formed colonies, is now almost universally adopted as a fact approaching to certainty, and if so, they had no time to disperse themselves towards the north.

Two hundred years ago the inhabitants seem to have been of Talian extraction, somewhat related to Siam; and Martaban is mentioned by the Portuguese as a place of great commercial importance; the town of Tenasserim was an important fortress. The provinces remained under Siamese dominion until the latter part of the eighteenth century, when Alompra, the conqueror, took possession of them; and notwithstanding the repeated contests and incursions of the Siamese, they remained a part of the Burman empire until they were incorporated with the British empire in the east, in the year 1826.

*Change of population.*—With new conquerors arrived new settlers. After Alompra's conquest the Siamese seem altogether to have with-

drawn, and to have been supplanted by the inhabitants of Burmah.

*Forcible introduction of people.*—In many cases the introduction of new inhabitants was forcibly effected; of this we have still a proof among the Burmese inhabitants of the village of Tenasserim. After the conquest and destruction of this once important town, the governors of the province intended to rebuild it. The Burmese however, transplanted to that place, were more than any others exposed to the continuing invasions of the Siamese, who used to carry every Burmese into slavery. The inhabitants returned therefore repeatedly to the sea-coast, and Mergui became in consequence the chief town of the province. To force however the inhabitants to remain at Tenasserim, a number of people, formerly runaways, were marked with a painted ring round their eyes, and an inscription upon their chests, and many of the older inhabitants of Mergui and Tenasserim are yet to be found with these indelible signs.

*People now inhabiting Tenasserim.*—The people now inhabiting the Tenasserim provinces, altogether in number not exceeding one hundred thousand, are Burmese, Talians, Siamese, Kareans, Seelongs, and foreigners.

1. *Burmese.*—The Burmese, the former conquerors and lords, are to this day the most numerous. Their chief seat was Martaban; the settlement of Mergui was the second in importance; Ye the third. Maulmain is of recent origin, sprung up since the occupation of the country by the British.

*Situation of their villages.*—All villages, hamlets, and even solitary plantations of the Burmese, are near the sea-coast, or on the banks of navigable rivers, or creeks. They never established themselves far inland, even since the time of their first settlement in the country.

Apprehensions of Siamese incursions, natural predilection for water, and the facilities of transporting themselves and their goods through a country where roads do not exist, and if they exist, are with great difficulty kept in order, will be found the reason.

2. *Talians—from whence.*—The Talians are the inhabitants of the kingdom of Pegu, formerly the lords of Burmah, now subdued, and the slaves of the Burmese, by whom they have been since that time always treated with severity and barbarity. The greatest part of the original country of this people consists of plains of fertile rice-ground; and from the disposition of the Talians it would seem that nature had marked them out for husbandmen, and especially rice planters.

*Where settled.*—From the great tracts of alluvion which the mighty Irawaddy deposited, and which its numerous branches now intersect, as well as from the banks of the Pegu and Sittary rivers, the Talians extended to the Salween, compelled as it seems to spread and to retire, on account of the oppression exercised by the little controlled Burmese governors.

The province of Martaban, part of which is at present British, and comprised under the name of the Province of Amherst, was also inhabited by Talians, whence they seem to have spread from the banks of the Salween to the eastward, over the plains which are intersected by the waters of the Guin and Attaran. The mountain range to the east (now the frontier between Tenasserim and Siam) divided them from the river territories of the Menam, and appeared to form a barrier to their further extension from west to east.

*Reasons of their migration towards the east.*—But it seems the oppression of the Burmese in these districts, distant from the seat of government, must have been too severe to be borne; and forty thousand people expatriated themselves at once from the Province of Amherst into Siam, to exchange the yoke of Burmese rule for a milder despotism. When Amherst Province became British it was almost destitute of inhabitants.

*Sensation and feelings of the Talians towards the British at the time of their first arrival.*—At the commencement of the last Burmese war, the arrival of English soldiers in Pegu created an extraordinary sensation among the Peguans, the greater part of whom never before saw Europeans, who were represented to them as cannibals. When the first excitement subsided, and the people of Pegu had opportunities of perceiving that the foreign invaders were not only men like others, but much kinder enemies than they even thought compatible with the character of a soldier; they began to assist the British army, their hatred against their old oppressors broke out a fresh and they sincerely desired the total downfall of Burmese despotism.

The historian must regret to record, that conquered Pegu was again restored to the court of Ava, at the peace of Yandaboo. By this, these faithful allies were inconsiderately, and we may say mercilessly, delivered up again into the hands of their irreconcilable oppressors; an act, which they the least expected, as it was a notion incomprehensible to them, that a conqueror ever gives up voluntarily, what he once possessed indisputably. Many sought of course a refuge in the Tenasserim provinces, but many, chiefly those from distant parts, could not remove their families and goods in the first in-



stance, and were afterwards prevented from effecting their escape by the Burmese authorities. The cession of the kingdom of Pegu is the only reproach which this unfortunate race has to urge against the English.

*Maulmain peopled by Talians.*—The new settlement of Maulmain opposite to Martaban, now the capital of the Tenasserim provinces, was at first almost entirely peopled by Talians, and to this day it is computed that the number of Burmese to that of the Talians is in the proportion of one to twenty.

*Obliteration of their distinguishing features.*—The features of the Talians do not perceptibly distinguish them at present from the Burmese, the intermixture between the two races, which has taken place since many generations, has probably effaced or obliterated the distinguishing characteristics.

*Existence of the Talian language.*—That they are however a distinct people, is proved by their language, which they have preserved to this day, and which is said to have scarcely any resemblance to the Burmese. It is fast declining, and will probably cease to exist should the Talians continue to be subject to foreign powers, and there seems to be no probability of their again becoming an independent nation.

*Burmese language generally adopted.*—In British Tenasserim the Burmese language is adopted as the language of the courts, of public transactions, and of general conversation, which is but fair, as the majority of the inhabitants speak that language, and it is no grievance to the Talians, as two-thirds of them speak Burmese besides their mother tongue. The chief and almost sole occupation of the Talians is agriculture, and almost exclusively rice cultivation; they scarcely ever retire to the mountains, the amphibious life of a rice planter during six months of the year being to them the most congenial.

3 *Withdrawal of the Siamese from Tenasserim.*—Almost all the Siamese retired from these provinces after Alompra's conquest, except two villages to the south of Mergui, Boukpeen, and Lennya, where the Burmese had never resided; that part of the country, having always remained a disputed district.

From the time of the conquest, and probably before that time, Siamese and Burmese never met except as foes, and the system of alternate petty warfare, accompanied by kidnapping, plunder, and devastation, was carried on without intermission along the frontier districts, which in consequence, were soon transformed into a waste, and such they remain to this day. The Siamese seem to have been the

most dexterous in their plundering expeditions, and were, besides their greater daring, the most numerous ; for the Burmese in these provinces could only be considered as colonies, established partly by force, and kept up by dread.

*Security established since the British occupation.*—When security of person and property were established at the beginning of the British dominion, the Siamese government was given to understand that any such marauding excursions as were kept up under Burmese rule, would be considered as a breach of peace. The Siamese government released a number of people, about one thousand from Mergui Province, carried away during the last incursion, who were delivered up and returned to their homes.

The Siamese were of course permitted to come to the provinces on friendly terms. At first they were fearful, but when they perceived the difference between Burmese and English management, they gained confidence ; as the Burmese subjects once fled to Siam, to seek shelter under a milder yoke, so the Siamese now seek a refuge in Tenasserim.

*New settlements of Siamese.*—The Siamese population, consisting entirely of recent emigrants, increases, and there are settlements of these fugitives in several parts of the country ; their chief resort is the Province of Mergui, where they spread along the banks of the greater and lesser Tenasserim river.

Great difficulties it is said, are thrown in the way, on the part of the Siamese government, to prevent their migration. If caught, it is affirmed that decapitation is the inevitable consequence.

To reach the first British Tenasserim settlement, they have (besides the danger of being apprehended) great difficulties in passing through the pathless wilds ; whole families not unfrequently lose their way, erring for a month or more in the forests, reduced to the greatest extremities, living upon jungle-fruits, leaves, and barks, before they arrive near the sea-coast. It may be imagined that without these impediments, the influx of Siamese would be much greater than it is at present.

*Their character.*—The Siamese are an industrious, hardy race, and more enterprising than the Burmese, besides being easily manageable, quiet, obedient, and orderly. They would be, in greater numbers, a desirable accession in the wilds of Tenasserim.

They are the only people who have introduced the cultivation of the sugar-cane, for the purpose of making sugar ; of course as yet to such a limited extent, that it has not in any degree become important.

Many of them are huntsmen by profession, living for months in the wildest forests, where they shoot elephants for the ivory; they are also the trappers, tamers, and managers of elephants in general, to them in their own country the most important of domesticated animals; while in the Tenasserim provinces, under Burmese rule, elephant scarcely ever known tamed. The greatest part of the Siamese in the provinces approach more to the Malay than Chinese type in their features, which are generally very coarse, and their women very ugly, though both are generally well built, and taller than the Burmese. The huntsmen, particularly, are very nimble, sprightly, dexterous, and courageous; while the peaceful cottagers of the two settlements of Boukpeen and Lennya, which existed before the British occupation, are on the contrary dull. We cannot be allowed to judge of the Siamese as they appear in Tenasserim, for they were before they arrived the poorest class of depressed slaves, whom necessity only drove to seek a peaceable asylum. The more wealthy and favoured Siamese in the great delta or valley of Menam, and those towards the gulf of Cambogia, are said to be intellectually much advanced, and the great number of Chinese living among them, will have communicated to them more civilized manners, and improved modes of cultivation.

4. *The Kareans—their origin.*—The Kareans are the inhabitants of the longest standing in the provinces, who have survived the shocks of succeeding revolutions. Their origin cannot be traced. Some suppose them to be the aborigines of the country, some affirm they are the wreck of a great nation, fallen into dependence and slavery, expatriated and spreading afterwards over a wide extent of Indo-China, for they are found from the 11th to the 23rd degree of north latitude. The American missionaries, who are much interested about this people, are of opinion that they originally came from Thibet; the opinion seems however to rest only upon the congruity of names and some manners.

*Their station.*—Wherever they exist, they hold an inferior station in the country, excepting the so-called red Kareans to the north of Maulmain, who have resisted the Burmese influence,—they are mountaineers, subsisting upon prey and plunder.

The Kareans of the Tenasserim provinces, forming separate colonies, inhabit such parts as are unoccupied by any other inhabitants, which are the inland portions of the country; they there choose their abodes either on the banks of rivers or in secluded valleys. These communities do not generally consist of more than from three to twelve houses or families. As they have the custom of intermarriage, they are nearly related to each other. Soli-

tary huts of Kareans are often to be found in places where for many miles in circumference no other human being is to be found. They live exclusively upon the produce of the soil, planting mountain-rice, and some other indispensable articles, generally as much as they want for home consumption. Very rarely has a Karean a surplus, more frequently not sufficient to subsist upon.

Migration seems almost incompatible with the occupation of a husbandman, and is certainly a strange anomaly in a country highly productive; yet the Kareans subsist solely upon the produce of their plantations, and have no permanently fixed habitations.

*Modes of cultivation.*—When a Karean family has chosen a place for a plantation, huts of bamboo thatched with palm-leaves are constructed, and then a part of the forest is cleared, just as much as is necessary to plant the ground with rice, requisite to maintain the number of persons settled for a year. The paddy is sown upon the imperfectly burnt down forest, without any tillage or other preparation, and whatever else is wanted (cotton, indigo, sesam, vegetables, &c.) is promiscuously sown or planted on the same spot. The following year, another spot is cleared in the vicinity, and after some years, or when a death happens, the family removes to a greater distance, and begins again the highly laborious task of felling immense forest trees, visiting only from time to time the old establishment, which yet yields fruits surviving several seasons; and so the Karean wanders all his life time, without having settled permanently.

The reason for this extraordinary custom is differently accounted for. The Kareans say, that one and the same place does not produce rice for several years; an objection which is refuted by the example of other countries similarly situated, where new lands are not so abundant as here.

Others say, that there is greater trouble in keeping the ground clear from weeds, than to fell a new forest, which seems equally incredible. Probably the roaming propensity of the Kareans, and old established custom, are the chief reasons; to which must be added a great superstition and fear of *nāts* and evil spirits; such beings, having in their opinion, an allotted dominion over certain districts.

Whatever may be the origin of this extraordinary custom, certain it is, that the produce must be inferior; all perennial cultivation being in this way excluded, and gradual amelioration quite out of the question; hence it may be that the Kareans have remained always stationary, upon a low scale of civilization.

*Their fate under the Burmese government.*—Under the Burmese government the Kareans were depressed, and were liable to be called upon to do public works without remuneration, whenever it pleased the government.

This relation towards their masters exposing them to all kinds of vexations without hopes of redress, seems to have been the first reason of their retiring into seldom visited, or sometimes inaccessible parts of the country, where they hoped to be beyond the immediate reach of their oppressors.

Though they have been placed on the same footing with the Burmese since the conquest of the country by the British, and enjoy at present formerly unknown rights and an impartial justice, yet they are still so timid that they can scarcely be prevailed upon to visit the towns on the sea-coast.

They have a language of their own, which has lately been drawn from its obscurity by the exertions of the missionaries, though they are without any communication with their brethren in Siam and Burmah, even confined sometimes as long as they live to the narrow sphere of their self-chosen district; yet it is affirmed that the Burmese Kareans bordering upon China, at a distant of 13° of latitude, speak a dialect of the same language which is current amongst the Kareans of Mergui Province.

5. *The Seelongs—their origin.*—These are again a variety of people different from all others just enumerated. They are the last in the scale of civilization, but not the least interesting.

The Seelongs are the inhabitants of the islands constituting the archipelago of Mergui, and are a race of wandering fishermen, building temporary huts of reeds, palm-leaves, and bamboos during the inclemency of the monsoon, and passing the rest of the year either in boats, or on the sea-beach under the shade of trees; they live upon the spontaneous productions of nature, but chiefly upon the produce of the sea; turtles, fish, and shell-fish forming the principal food.

They never cultivate the ground. Their origin is unknown. Whether they are the wreck of some more numerous and independent nation, as they pretend to be, gradually vanishing from the face of the earth; or whether they are the descendants of shipwrecked people, a mixture of different races, augmenting in the course of time, will scarcely ever be determined.

*Their number.*—As they exist at present, they form but a petty tribe, not exceeding, it is said, one thousand souls in number, and they will probably soon be extinct, for they are diminishing annually.

They have a peculiar language, but too little is known of it to determine whether it is a mixture of the languages spoken around them, or a peculiar tongue.

*Their civilization.*—It may well be imagined, that they are on a very low scale of civilization, one should think far below the North American Indians; yet the term savages, so lavishly bestowed upon so many nations not meriting that epithet, is not applicable to them.

*Their communities.*—They form communities, divided into families, governed by strictly determined usages, which are always punctually adhered to; they accommodate themselves willingly to the laws of the government on which they are dependent; they carry on a petty trade of exchange; they have a correct notion of right and wrong; crimes are little known, and the transgressors rigidly punished; they live in peace and harmony amongst each other; their food is the spontaneous productions of nature; they are totally ignorant of what exists beyond their rocks and islands; they have no established form of religion, pretending, as they express themselves, never to have thought whether there be a future existence or not.

*Their former relations with Burmah.*—At the time of the Burmese rule they were the most independent and unharassed people of the provinces. The Burmese have always been very bad seamen, scarcely able to retain possession of the islands belonging to their territory, and never could cope with the skilful Malay pirates. The Seelongs however, though freed from Burmese oppression, were nevertheless not better off, for they were a prey to all the numerous buccaniers not long ago infesting these seas.

*Their seclusion.*—It is very difficult even to this day to meet this roaving tribe amongst the islands which they visit; they hide themselves whenever they see a strange sail approaching, and it cannot be denied, that they have reason to be apprehensive, for to this day irregularities can easily occur in the Mergui archipelago, where not a shadow of British authority is permanently established, on account of these parts having hitherto been entirely useless and unknown; and it is only to be wondered, that depredations on a larger scale have never occurred in those parts in late years.

*The whole population considered.*—These are the different races inhabiting the provinces. The small number of all (taking them collectively, not exceeding one hundred thousand) spread over an area of thirty thousand square miles, proves clearly that these unfortunate countries have been the constant scene of contest; that as the one or

the other nation settled, and began to thrive, it excited the envy and desire of a powerful neighbour, who in a single successful invasion devastated all, exterminated, dispersed, and carried away the population; and that the descendants of these, in their turn, were treated in the same manner by subsequent conquerors. The Talians, the Siamese, and Burmese, experienced successively these calamities, and the remaining mixed populations are the wreck and ruins of their forefathers, surviving their former sway and subsequent downfall. The Kareans and Seelongs, who as far as it is known, were always in subjection, had still less opportunity to increase and flourish.

Having no country of their own to retire to, they in the first instance under the scourging authority of the conqueror, felt all the calamities of invasion, and never enjoyed a time of undisturbed peace and prosperity, which was at least accorded to the conquered, in the intervals from one invasion to another.

6. *Foreigners—Chinese.*—The most important and most useful of all foreigners are the Chinese, whose semi-compulsory emigration disseminated them over the whole of the Indian archipelago, and other adjoining parts.

The tide of this emigration poured in, in the first instance, into Cochin-China and Cambogia, on account of their vicinity to China Proper, and half of the present inhabitants of these countries are represented to be of Chinese origin. They have acquired great importance in Siam, where 200,000 of this people are said to be alone in Bankouk and its neighbourhood. The Chinese also form a part of the population of the Philippine Islands. The Dutch though treating them from time to time very harshly, patronize them on the whole, in their possessions and dependencies, and their numbers are continually augmenting in Java, and in the Moluccas. Chinese are settled in Borneo, Celebes, Timor, and Sumatra. The British possessions in the straits of Malacca are full of Chinese; and Chinese are found to the north of Ava in Burmah.

*Their settlement in Tenasserim.*—The Tenasserim provinces held out but a slight prospect to the Chinese under Burmese rule, on account of the insignificance of the country. The Burmese authorities seem to have encouraged their settling, and the small number who did settle, acquired wealth and consequence, by succeeding in monopolizing the few lucrative branches of occupation in the country. They do not palpably increase, but will certainly augment rapidly when the provinces become of greater importance.

*Their occupation.*—The first forms in which Chinese appear in a foreign country are, either as merchants if they have any capital, or as artificers, if they have none. In Tenasserim the Chinese are merchants and ship owners, or ship-builders, spirit brewers, carpenters, blacksmiths, bakers, and gardeners. The introduction of Chinese in great numbers ought to be encouraged; they would be a great blessing in the wastes of Tenasserim if they would turn husbandmen.

To the generality of this people, Tenasserim as a promising place of resort is unknown, and it is the interest of the Chinese already settled to obstruct a more general introduction of their countrymen, in order to avoid competition. All Chinamen settled here confine themselves to the chief places on the sea-coast. All are married to Burmese women, and their children, if males, are brought up as Chinese, adopting the customs, manners, and dress of their fathers; they are however easily distinguished by their features, which are generally, in the eyes of Europeans at least, more comely than those of either of their parents.

*People from India.* 1. *Chinlias.*—The natives of the Coromandel coast, here generally known under the name of Chinlias, somewhat resemble the Chinese in their voluntary expatriation, which has its origin in the too great population of their own country, as they say; but probably much more from the facility of acquiring abroad in a shorter time, a sum of money with which they think to return like the Chinese into their own country again. By far the greater part of both however, have either not had time to accumulate enough, or think they have not enough, and they die before they accomplish their design. Their progeny, a mixed race by native women, is settled for ever in the country. A considerable number of these Chinlias are to be found in Penang and the other Anglo-Malayan possessions. They partly preceded, but many more followed, the extension of the British power in Tenasserim.

*Their numbers.*—Their number is not great, and they are confined to the places where Europeans reside, with whose customs and wants they are much more acquainted than the natives, and by administering to which they gain their livelihood.

2. *Bengalees.*—The same may be said of the Bengalees, who however are always inferior to the people of the peninsula of India in enterprise and capacity.

3. *Convicts.*—The convicted felons transported from Hindoostan, form also a part of this class of foreigners. Their number exceeds at present one thousand seven hundred.



*Their fate in Ténasserim.*—These unfortunate men are always treated with the utmost mildness, and the present state of many of them, who are well-behaved, is undoubtedly better than it ever could have been in their own country. The system is introduced, that after a few years' transportation, if they behave properly their irons are taken off, then they can be hired out either as workmen or private servants; as they have then opportunities of mixing with the inhabitants, they have also an opportunity of forming connexions with native women. Many of them, when the term of their banishment is expired, settle in the country, (hitherto but few of them have served out their time); they then form part of the population, as well as their progeny.

*System of transportation.*—This system has been much blamed, and certainly the introduction of so many felons into a country cannot contribute to improve the manners of the original inhabitants, but it does not deteriorate them in that ratio, as is imagined.

*Difference between Indian and European felons.*—An Indian convict is a different being from an European felon, and almost universally the former will be found superior to the latter.

*Thugs.*—The hideous crimes of the Thugs (the by far greater majority of convicts in Tenasserim are Thugs, or professional murderers) originate in religious motives, and when religious motives are set aside, yet the majority of the Thugs have been brought up from their infancy to murder as to a trade; after their conviction, they prove by their conduct that they are by far not so much depraved as they are supposed to be. The transportation of criminals from Hindoostan to this as well as to other territories, instead of confining them for life in loathsome prisons, is a commendable political act, and it is natural, that such parts should be chosen which are the most distant and in want of population. Though it seems never to have been the intention of Government to form in Tenasserim a penal settlement in imitation of New South Wales, yet part of the Hindoos will undoubtedly become colonists in course of time.

*Armenians and Parsees.*—Wherever there is a commercial place in the East, holding out a prospect of gain, there we are sure to find Armenians, Moguls, and Parsees, the chief native merchants, resembling in a great measure the Jews of Europe, chiefly such as they were in the time of the middle ages.

They are equally a dispersed people with the Jews, without a country of their own, equally industrious, persevering, and shrewd, and equally oppressed when they trust to native princes, but notwithstand-

ing wealthy. Until now Maulmain is the only place where they have settled, because it is the only place in Tenasserim carrying on trade.

*The Portuguese.*—The descendants of the Portuguese, so generally spread along the sea-coasts on both sides of the peninsula of Hindoostan, are also found in Tenasserim. No nation left so many survivors of its transient glories in the East as the Portuguese; but the progeny of Vasco de Gama's followers is sadly degenerated; they have retained nothing of their renowned forefathers, but the type of their religion, which is however with them only a heap of superstition and show of outward ceremonies, besides their language is barbarously corrupted by numerous Indian idioms. The European features are recognizable in many, but their condition and state of civilization are nearly the same with those of the natives amongst whom they live, and frequently much lower. They have all formed connexions with native women, and have no tie which unites them with Portugal, of which they are altogether ignorant. Their being nominally Christians, and their steadiness in adhering strictly to their faith, preserve them as a distinct class.

*American missionaries.*—There are a number of American Baptist missionaries in the provinces. They have made little progress in the conversion of the natives. The Burmese do not well know how to draw a difference between Englishmen and Americans, and they consider the latter to be a peculiar variety of itinerating white people, whose real aim and purpose are to this day unknown, or indistinctly guessed at by the multitude, and to the knowing few, a puzzling enigma. They pass under the name of foreign teachers.

*Englishmen almost all in official capacities.*—There are besides the civil officers of government, and the body of military officers belonging to the regiments, and besides the Europeans constituting the regiments, (two at present), few English residents here, and these are almost all congregated in Maulmain, where they are chiefly engaged in ship building, or otherwise connected with the teak forests in Amherst Province. Until very lately not one English gentleman thought of settling for the purpose of calling forth into practical use the numerous resources of the country. All Englishmen have hitherto been on friendly terms with the natives, in every part of the country. The Burmese population have too much regard for their new governors, not to treat with politeness, affability, and good-will every individual with European complexion, and no European can ever have had reason to complain. The awe which European superiority, and

British political ascendancy inspires and spreads throughout the Eastern nations, influences probably as much the natives to treat an European with particular consideration, as the appreciation of security and of a mild rule conferred by the British, over such a great portion of mankind.

*Character of the natives superior to the Indians.*—The character of the natives in Tenasserim is, on the whole, praiseworthy. By all who have had an opportunity of drawing a parallel between them and the natives of India Proper, they are declared superior to the Indians. One of the peculiar features of Burmese character, and one which is to a superficial observer striking, is their independence and manliness, forming a striking contrast to the submissiveness, humility, and effeminacy, so universally met with in India.

Independence and manliness is an apparent anomaly, if found amongst a people, who have been swayed by one of the most despotic governments in Asia, since time immemorial ; but to account satisfactorily for this apparent discrepancy, it is necessary to keep in view the nature of Indo-Chinese despotism. It is laid down in these countries, and considered by all people as an indisputable axiom, that all and every thing is the property of the king, and that the king is lord of life and land. This rule of state and nations adopted in Indo-China, operates differently for the rights of men, though they have been always under such an axiom unknown, or not understood, yet the infringement of them, could not have been every where effected equally.

I confine my observations to Tenasserim, endeavouring to shew, that independence can exist, even where a man is doomed to be the property of his sovereign from the moment of his birth.

People in Indo-Chinese governments, are theoretically slaves of the king, but not virtually. The government could not use the whole population for government purposes. If part of the population were called upon to sacrifice their personal liberty, either to carry on a war, or to accomplish some public work, it could be only a temporary measure, and after the purpose of government was effected the majority would return again to their homes, released from their temporary bondage. The infringement consists in the unjust, forcible, and arbitrary exaction of the property of the subject.

Tenasserim formed an out-station of the Burmese empire. Governors were sent to manage public affairs, who were often superseded by others, before they knew the resources of the provinces. The inhabitants therefore easily found the means to deceive their superiors about their abilities to contribute to the revenue, or refused to do so.

The village head men, or Thoogies, were generally elected out of their own tribe, and by bribing them the villagers often succeeded in deceiving their superiors.

The Tenasserim provinces were a conquered, ruined country, thinly peopled by Burmese colonists, which never yielded a considerable revenue to government. Taking the inability of the population for granted, the exactions from Ava were more moderate; and when the exaction of the governors, and the oppression of government became insupportable, part of the population found an asylum in the wilds of the country. It is said to have been a common occurrence for people to abscond with their property into the jungles, and there wait for more auspicious times. So common must have been the practice, that after a fourteen years' peace, and annually strengthening confidence in the present government, the Kareans to this day cannot be persuaded to come to town, because they have apprehensions for their personal safety.

When the rumour spread over the provinces, in 1838, that Tharawaddie's armies were approaching to reconquer the country, the people of Tairy and Ye laid up stores of rice in the jungles, ready to fly at the approach of the foe.

Their being greatly freed from the influence of priestcraft, as will be shown afterwards, and their having no castes as well, are two additional weighty reasons for speaking in favour of their independence. Their manliness is ascribable to the same source. The greater portion have often been reduced to extremities in the jungles, where skill and courage were called into play to extricate them from difficulties, and they have enough opportunities to this day to exercise this spirit of manliness, in their often protracted wanderings in the pathless wilds of their own country. Out of this state of the country, such as it was under Burmese rule, sprang another characteristic of the people, not less prominent, but not at all praiseworthy; this is cunning, shrewdness, and falsehood. Where people of every rank, from the commonest coolie to the prime minister, had to deal with despots, at whose mercy they were without appeal, and where they had to practise every kind of delusion, to evade the manifold tyrannies which threatened them, cunning and shrewdness were therefore considered virtues of the first magnitude. The common daily bazar proceedings, however, furnish a proof that they are honest enough in mercantile transactions, far more so than their Indian neighbours, and much more than the crafty, treacherous Chinese.

All engagements ought to be ratified in public courts, then they

will be observed ; for the natives have such a dread of judicial proceedings, that they will scarcely ever infringe upon publicly made contracts. When after the British occupation, all was placed on a certain undeviating footing, cunning and shrewdness became to them of less avail, and are said to be daily less common. One bad quality however remains with them from the time of Burmese rule, which they cannot get rid of, this is falsehood in speech. A Burmese if asked a question, even of the most unimportant nature, scarcely ever gives a direct answer, but will ponder a long time, and then couch his words, in an ambiguous sense ; and if he cannot succeed in this, he will plead his ignorance straight forward, though he may be well acquainted with the subject asked. This want of good faith is a bad quality in a subject, and it would naturally follow, that an attachment to the government cannot be relied upon, and the British government ought to be on a continual guard not to be overthrown by treachery. It can be supposed, however, that there is no fear of that ; the dispositions of the Burmese on any other subject may be as doubtful as possible ; but the boon which has been conferred upon them by an equitable administration is so generally appreciated, that they fear only the present state of things will not last for ever. Only few individuals, once in power, might gain by a change ; but they will never find adherents amongst the mass of the population ; from a rebellion therefore, the government has nothing at present to apprehend.

*Religious connection of the Burmese in Tenasserim with the king of Ava.*—Profound veneration and attachment to the present royal family in Ava is generally spread, and has its source in religious feelings—Gaudama the first of beings, and the royal family the next in rank in this world.

Though the Burmese in the Tenasserim provinces know that they are at present quite independent of the ruler of Ava, and are not influenced by any of his ministers or governors, yet they consider the emperor of Burmah as the head of religion, but acknowledge cordially, the worldly supremacy of the English. The more enlightened and wealthy of the inhabitants take a lively interest in the affairs of their ancestors' country ; the overthrow of the king and his ministers, the usurpation of Tharawaddie, the subsequent expulsion of the crown prince, were watched with anxiety, and the present cruel proceedings keep them in awe and suspense.

The Burmese hold the customs of their forefathers in high veneration, but not so the laws imposed upon them by their superiors. The reason is, that the laws until lately have always been

arbitrary, too often not conducing to their happiness, and frequently contrary to their interest. The Burmese accustomed to tyranny, never questioned the right of imposing whatever laws their superiors thought proper, but they opposed them when they had the power, and evaded them when they had the opportunity. \* \* \*

The love of country in the Burmese, is based much more upon natural, than moral ties. It is the face of the country, the manner of living, the similarity of occupations which ties the Burmese. As far as his language is spoken, and the face of the country is the same or similar, this is his country. From the banks of the Tenasserim to the mountains above Ava, forming the Chinese frontier, a Burmese is at home, and would be so in Cochin China could he make himself understood. The moral ties, the recollections of his youth, his parents, his wife, his children, do not so much rivet him to the spot, as the ties above mentioned. Hence a Burmese is easily induced to exchange his sojourn in Mergui for a better livelihood in Maulmim or Rangoon, but a Burmese will never be found to expatriate into Hindoostan Proper, and very few are to be met with in Penang.

*Common Interest.*—The common interest which an assemblage of communities exercises, has little weight in the eyes of a Burmese. He prefers the British countries, because they are safer; but supposing an equal guarantee were held out to him in Pegu or Ava, he would scarcely settle there as in the Tenasserim provinces.

Fame, fortune, and power, cannot be appreciated by the natives of these countries otherwise than as they contribute to their bodily welfare. To consider them as the means of accession to moral ends, would appear ridiculous to the Burmese. The above passions had amongst the Burmese, a much wider field for development under their own government, than under the British. The wish to become illustrious seems at present to be nearly stagnant, they perceive that the Europeans are mentally their superiors; that the power wrested from them, is entrusted entirely to the former; and they know that they have to develop their talents only in the functions of native magistrates.

Desire after fortune is innate in every human breast, but it is less inordinate in the Burmese, simply on account of not knowing how to employ it; for fame and power, cannot be longer bought with fortune. It formerly rendered a Burmese famous, to employ his fortune in building pagodas and endowing khiaungo, or monasteries. The people emulated the prince and the ministers, who expended immense sums in this way. The British government has nothing to do with the

embellishment of Buddhistic symbols, or with the support of the numerous Buddhistic monks, and the people begin to be tired with the exertion of a sort of fame, which is not appreciated by their superiors.

*Avarice.*—Avarice, or an inordinate desire after fortune, without considering it as the means of gaining any thing else, seems as far as I have observed, no native vice. The Burmese hoard up money frequently in secret places under pagodas, not unfrequently in the bamboo rafts of their houses; but this does not originate in avarice, but in the apprehension of insecurity, and ignorance how to employ the capital advantageously. All Asiatic nations, living under despotic governments, who have constantly the violation of property to fear, act in like manner, and bury their valuables. British stability is not yet understood, and the certainty, that the British will maintain the country against expected attacks from Burmah and Siam, not yet believed in; so that the natives cannot be blamed for following the impulse of their distrust.

*Rights of property.*—The rights of another's property, are well understood and generally held sacred; except in the larger places on the sea-coast, where, like in all larger congregations, irregularities are much more common; however very few thefts happen in the country; property entrusted to natives by Europeans is very rarely embezzled; and with money they are considered more trusty and honest, than the same classes in Europe.

*Robberies.*—Robberies committed on the highway, or on the water, are unknown as far as I am aware since the British occupation. Those committed on the Salween last year cannot be imputed to the Tenasserim people; they were perpetrated at the instigation of the hostile neighbours on the Burmese side.

*Murder.*—The same may be said of murder. To commit deliberate murder is not within the sphere of Burmese character, and murder committed in passion is equally rare, for the Burmese are much more calm than excitable, and form in this respect a great contrast to the Malays, their neighbours.

*Passions—revenge.*—That the Burmese are not passionate, is obvious even to a superficial observer; how far they are revengeful I do not know; however, I never had an opportunity of witnessing inveterate rancour, or hatred. There are no hereditary quarrels; in which respect the Buddhists, amongst other good qualities, have again the preference over the Mussulmen; the neighbouring Malays being

equally famous for implacability, with their religious brethren in Arabia.

*Politeness.*—The opinions which have been disseminated in Europe about Burmese in general, where they were represented as blood-thirsty barbarians, are wrong. On a mere superficial acquaintance, their mildness and placidity are apparent. Their behaviour is conformable to strict rules of decency. Politeness is the characteristic of all the natives of Indo-China, which amongst the lower classes in Europe is too little exercised, and which is again exaggerated when speaking of the Chinese. The Chinese are more formal than polite, on the contrary, they are sometimes rude. The Burmese are naturally polite, not only to strangers, but amongst themselves. Boat people gathered together by order of government, and strangers to each other, live crowded in a small place for months in an uninterrupted state of harmony. Common coolies address each other as Sir, and the rare occurrence of fights and quarrels amongst the lowest classes, shows, that they know how to pay each other, on all occasions, that deference which is due to a fellow creature.

*Courtesy and good fellowship.*—Courtesy and good fellowship are strictly adhered to; the people of one village form a community, bound together by friendship and mutual wants; and a stranger not entering into their adopted mode of life is not tolerated.

*Exercise of charity.*—Charity is little exercised in a country where real wants do not exist. The disabled and decrepid are maintained by their families, relations, or even by strangers. The exercise of charity amongst the Burmese cannot be considered a virtue, as its practice does not call for a sacrifice, the alimentary subsistence of a person amounting monthly to a mere trifle.

*Hospitality.*—Hospitality is considered in all (not European) countries, not a virtue, but a duty, for in a country where the comforts of life are not so far advanced, as to lead to the establishment of inns, all intercourse with people in distant districts would be interrupted without hospitality. Hospitality in general, is dictated either by philanthropy or by religion. In the latter case, it embraces men of a particular sect, party, or nation, and such hospitality is chiefly exercised in Mussulman countries; philanthropic hospitality has its origin in the common rights of society,—such is exercised by the Buddhistic nations. In all parts are *zayats*, or resting places, built expressly for travellers, who take possession of the building by right, and if the travellers be poor, they are provided by the inhabitants with food, sometimes on application, and sometimes without.



It is a peculiar institution in Buddhistic countries, to erect sheds at short distances in which are placed chatties (earthen vessels) filled with water to afford drink to the wearied traveller.

*Temperance.*—Temperance is one of the shining qualities of the Burmese; their fare is simple, moderate, and wholesome. They subsist chiefly upon vegetable substances,—rice is their chief food, all other ingredients secondary.

Like all natives of the tropics, the Burmese are fond of spices; these condiments seem necessary to digestion in equatorial climates. The majority of the people, who are Buddhists, do not drink spirits, a drunken man being considered a degraded being. The Karens make an exception, they indulge in temporary intemperance on solemn occasions. Opium smoking exercises its baneful influence wherever the drug is introduced; it is fortunately however too expensive a vice, to which rich people only can be addicted. In the public opinion, it is held degrading, and the epithet of 'Opium smoker,' denotes a bad character, capable of performing the worst acts.

All nations whose climate permits them to remain unencumbered with clothes, whose abodes permit the free circulation of air, whose occupations are mostly in the fields and woods, and require a free exercise of the limbs of the body, will be found possessed of agility, dexterity, and hardiness, which are the concomitants of good health, if no local causes operate inimically. The Burmese in Tenasserim are remarkably healthy, strong, and muscular, without being powerful.

*Perseverance.*—The Burmese are capable in moments of excitement of great exertion, but their energy is of short duration. Want of perseverance is a characteristic of them; the reason of which may be, that few of them are engaged in regular, never ceasing, monotonous labours. The Burmese mode of life does not force them to toilsome, long continued exertions. In a highly cultivated country they gain their subsistence with little trouble, and because they scarcely ever know absolute want, or even poverty, they are more indifferent to affluence.

*Patience.*—Patience is the result of that mode of life which people are generally obliged to lead, who occupy countries where nature has scattered her bounties with parsimony. Though few of the Burmese are exempted from the cares of life, and the vicissitudes which attend a regular occupation, yet disappointments are not often experienced; and as only the repeated experience of disappointments creates patience and endurance, the Burmese cannot possess that virtue.

*Love of children.*—One of the chief virtues of the Burmese is the love of their children, so long as they are young and helpless. This characteristic they have in common with all nations who live in a state of nature, the social connection between child and parent being the first and strongest. Burmese parents are in a state of distraction when any accident happens to their progeny; and the death of the child is often considered an irreparable calamity. Great numbers of children cannot be a burden in a country which is highly productive, thinly peopled, and enjoying security of life and property. A childless age is considered one of the greatest punishments imaginable. It will easily be perceived, that under such circumstances infanticides are entirely unknown. It does not seem here to be the case, that the love of the child holds equal pace with that of the parents.

*Love of parents.*—The facility of gaining independence, and the state of almost unbounded liberty in which the children roam about from their first infancy, loosen very much the ties of filial duty; there are however, but few instances of direct ingratitude on record; numerous cases however are known, where a son has taken voluntarily a debt of his father upon himself, and become a debtor servant for 7 to 10 years, to deliver his father from ignominy and prison.

*Marriage.*—Marriage is entirely a civil act amongst the Burmese, and considered as binding only so long as both parties find it convenient. Separation is of daily occurrence, and no public blame is attached to it. Such union cannot be supposed to possess moralities. Natural fidelity is therefore not absolutely required, and adultery is the more frequent, as there is no public ignominy attached. So an adultress; a women lives in illicit intercourse with the consent of her husband, and when separated can form again a new union without prejudice to her, and without her new husband troubling himself about her past conduct. The seduction of unmarried girls is rather a rare case, almost impossible; because a girl attaining the age of puberty is as soon as possible disposed of by her parents. The infidelity of the wife here forms a striking contrast to the rigorous jealousy with which females are guarded in all Mussulman and Hindoo countries; it is not only met with in Burmah, but equally in Siam, Cambogia, and Cochin-China. The natives of these countries all professing Buddhism, it seems to have its source in religion, much more as the Kareans, who have no positive mode of worship, are in this respect much more strict than their Buddhist brethren.

*Polygamy.*—Polygamy is allowed in Buddhistic countries, and the number of wives is (as wherever polygamy is introduced) in propor-

tion to the means of maintaining them. The generality however are content with one wife at a time, and the bad effects of polygamy are confined to the comparatively small number of the wealthy. Marriage is contracted easily. The difficulties in over peopled countries, where a certain settlement or occupation in life, or a certainty of income is necessary, before people marry, are not experienced, here where every body if he like, can maintain a wife and family with ease. Polygamy and faithlessness, divide and loosen the affections of parents toward their children, yet it has been stated that the Burmese doat on their children ; and it is a strange anomaly, which is however daily seen at Maulmain, that a Burmese has a particular predilection for a fair child by his wife, even when he is well aware that it is a spurious offspring. This is, however, only the case amongst the lower classes. We have not yet any proof, how children by English fathers and Burmese mothers will turn out when grown up, the intercourse between the two nations having subsisted but fourteen years ; if we however may judge from what the children promise at present, we should be inclined to anticipate that they will be superior to the progeny of Europeans by Indian women.

*Religious establishment for the education of the children.*—Polygamy and connubial faithlessness have also in general bad effects upon the education of children, diminishing the care and attachment which ought to be felt. The religious institutions of the country have provided for this case. The children are at an early age placed in monasteries, established at almost every village, and endowed by the voluntary contributions of the inhabitants. There the children remain for a certain period of their boyhood, where they are fed by the monks, and instructed in reading, writing, and religious rites.

This is the education which almost all Burmese attain, but they seldom know more ; hence the general diffusion of elementary knowledge, and general ignorance in the higher attainments of science, and the great uniformity of knowledge throughout Burmah.

*Knowledge of the priests.*—The Pomgys, or priests, are considered the learned men of the nation ; but their knowledge consisting in the explanation of theological and metaphysical doctrines, is therefore mystical, but the more appreciated by the vulgar majority, because incomprehensible.

*Religion.*—The peculiarities and characteristics of a nation are mostly intimately connected with their religion. Religion either dignifies or degrades the human character. In considering the religion of the inhabitants of these countries, we must form a distinction between

the Seelongs, Kareans, and Burmese, for all three have different creeds, and therefore different ideas of the Deity.

*Religious belief of the Seelongs.*—The Seelongs must be considered in this respect, as a people in the lowest scale. Yet the idea of the Deity forces itself upon the most savage mind.

These people have no religious creed, they have no established mode of worship, i. e. no outward manifestations of their acknowledgment of a superior being; yet they have a vague idea or impression, that there exists besides mankind, some other not visible beings, exercising an influence over the destinies of mankind, &c.

To them even the notion of polytheism and idolatry is too vague, and as far as I could, after a prolonged inquiry, understand, they believe that the sea, the land, the air, the trees, and the stones are all inhabited by nâts or spirits, either good or evil; who direct the motions of these bodies; who produce the growth of plants, &c., &c. How far these spirits influence men, they do not pretend to know. Of a future state they are entirely ignorant upon for in touching, this question, they invariably answered, "We do not think about that." The observation of things around them, seems therefore to strike their poor minds; and their small share of reflective power, leads them instantly to the acknowledgment of an invisible superior being.

The dawn of reasoning and the idea of a Deity, however imperfect, seem therefore identical; and the belief in nâts or spirits, seems to be the first and lowest of all religious creeds. The opinion that the lowest religion begins with idolatry, is not corroborated by what we find amongst these people; the Seelong's idea of a Deity is so imperfect, that he does not even represent it by a figure. The idea of the Deity being in its infancy indefinite and vague, idolatry itself is an advance to positive religion.

*Religious belief of the Kareans.*—The Kareans, who are already more advanced than the Seelongs, have also the idea, that certain trees, or caverns, or animals, are the abodes of mighty spirits, to whom they however do not as yet assign a form. The Burmese on the contrary, who have already their system of the Deity, embody these notions, form images, and pay them superhuman devotion, as the representations of these conceived and systemized ideas. The Seelongs apparently not believing distinctly that superior and invisible powers directly influence mankind, propitiary sacrifices, and an external mode of worship are not introduced. The Kareans having an idea of the direct influence of nâts upon the destinies of mankind, offer sacrifices to them, consisting of fowls, tobacco, rice, and pieces of mo-

ney, depositing them in certain reputed places in the jungles, and sometimes under small sheds, near their houses. The Burmese have a strictly observed ceremonial, external worship, celebrated in temples, pagodas, &c., &c.

If it is true that morals cannot exist without a positive religion, and that morals cannot be maintained without the notion of a future state of rewards and punishments, the people of this portion of the world cannot be in our sense moral, for the Seelongs and Kareans have no established religion, and the religious creed of the Burmese even excludes a continued active state after death.

*Buddhism.*—The leading features of Buddhism are predestination, metempsychosis, and final annihilation or absorption.

The principal moral precepts of Buddhism are the following,—

1. Eschewing every kind of evil.
2. Fulfilling of good.
3. Purifying or cleansing of the heart ; which latter again is obtained by *Neggen sheet ba*, or the eight good ways, which are, i. Caution. ii. Security. iii. Rightly directed intelligence. iv. Right actions. v. Right words. vi. Right opinions. vii. Right intentions. viii. Right way of supporting life. According with the destiny of their good or evil actions all men pass after death into certain forms, become nâts, or a lower degree of spiritual beings, or they continue to be men, or they turn into brutes. The highest degree of perfection to which any being can or will come, after passing through numerous grades of nât existence, is *Neibban*, or annihilation, or following the translation of others, an existence in a perfect state of quiescence. This is the essence of Buddhism, a religion generally diffused over a great portion of Asia, probably, counting no less disciples than Mahometanism or Christianity. Most of the people are satisfied with performing the rites of their religion, without attempting to understand its theology, and even among the priests few are able to expound their religious tenets, because there are few who can read and write Palí, in which language their religious system is written.

They content themselves with the recitation of certain prayers, invocations, &c. and, the priests as well as the mass of the people, find it much easier to perform external ceremonies. The Buddhist adherents do not try to make converts, at least not in this country, and they are equally tolerant to all sects ; they do not affirm that their creed is the best or alone true, but say it is that religion fitted best to their country, state, and individuality, and they adhere strictly to this faith.

*Conversions to Christianity in Tenasserim.*—Few Burmese turn

Christians from the conviction of the superiority and blessings of our religion; and isolated are the cases of those, who for the sake of worldly gain became nominally Christians. The missionaries have hitherto signally failed in their endeavours, and the reason of the want of success with the Burmese is not fanaticism or obstinacy, but religious dogmatical indifference. They admit the beauty of Christian morals, but contend that theirs is equally good; and with reference to the dogma they say, that the Christian is equally unintelligible with the Buddhistic, and that in comparing both, they do not see any great difference; it would be bad to abandon their notions and customs, their families, and all that is holy and dear to them, to follow the advice of strangers. Kareans, on the contrary, who have positively no established mode of worship, embrace Christianity; and some of the American Baptist Missionaries, who settled amongst them, did much good. Infinitely more could be done, if all the Missionaries were equally well fitted to open the hearts of these simple children of nature by mild persuasions, instead of filling their minds with distrust by holding up the terrors of damnation.

*Recapitulation of the aforesaid.*—After having touched upon the essence of religion, the state of morals, the characteristics and peculiarities of the people, we are led to the following conclusions—

1. That the inhabitants of the Tenasserim Provinces possess the virtues of uncultivated nations.

2. That they cannot be expected to possess the higher morals and virtues of nations advanced in civilization; that fortunately the vices of polished nations, are, if not unknown, yet rather rare amongst them.

3. That their vices are in a great measure the consequence of the long misrule of highly oppressive and arbitrary governments.

4. That they possess original views of morality, different from those of Europeans on certain subjects, which are chiefly applicable to the comparatively low estimation of chastity among their women.

5. That the whole nation is educated to a certain degree, but that education stops short at that point, and that no higher cultivation can be expected from the present state of things.

6. That religion is no impediment to their advancement, as it does not imbue them with prejudices against other creeds, and that the absence of the caste system, so obnoxious in India, is a great advantage if their improvement be contemplated.

7. That the Burmese are therefore capable of great improvement.

*Diffusion of European knowledge.*—Very little, or nothing has hitherto been done by the British government, to educate the people.

There are three schools established ; however, they are more for the benefit of country-born and Portuguese than for Burmese. The Burmese are not averse to learning European arts and sciences, on the contrary they have a predilection for every thing European, the whole nation being convinced, that Europeans are superior to them in every respect.

If means and inducements were diffused to learn the English language, it would form the first important step to the mental improvement of the Burmese ; for with the introduction of this language, English sentiments are easily instilled. The establishment of well regulated schools upon these principles would be a great boon, especially if the distinguished pupils, were rewarded with minor places under government.

It would have, besides, the great advantage of rendering the people more attached to their foreign rulers, and acquainted with English ways and customs, of which they are at present entirely ignorant.

The present form of government is too new, too strange to them ; the relations between the British and the natives, too few, and too distant to expect, that sympathies should at present exist, or attachments be formed.

Though the British government all over India is well established, and is preferred, because decidedly better than any other formerly existing, yet the governing and managing Englishmen, personally, though in many instances highly esteemed, are not always liked, and very rarely beloved, because they are in most cases to the natives a strange enigma.

*Value of the Tenasserim provinces as a part of India.*—In the first years of their occupation, the question was raised, whether it would not be more advantageous to restore them to Burmah ; and when this was abandoned, because deemed impolitic, they were kept as a necessary burden, the expense annually exceeding the revenue derived from them.

Their possession, however, is valuable in a political point of view, besides, containing the elements of great wealth and riches, which want only development, to become pre-eminently conspicuous.

1. They command a great part of the eastern side of the bay of Bengal, which bay became, since the occupation of Tenasserim, a British sea, excluding any other power, and affording additional security to the rest of the Indian possessions.

2. They prove an advantageous position towards Burmah itself,

which is peculiarly visible at the present juncture of affairs with that power. Maulmain being the main point from which an invasion and conquest can easily be accomplished, without being obliged to plunge at once, as in the last war, into the hostile territory.

3. Their natural wealth consists, in a number of valuable productions, unknown at the first time of their occupation, and which are more or less wanted in India, such as tin, iron, coal, teak, and other valuable timber, and a host of other minor productions.

4. They afford the best possible field for European enterprize, being adapted for every kind of tropical cultivation, affording therefore the greatest inducement to make them the resort of Europeans.

ART. II.—*Memoir on the Climate, Soil, Produce, and Husbandry of Afghanistan and the neighbouring Countries.*—By Lieut IRWIN.<sup>1</sup>

### PART III.

#### SECTION, III.—*Of Animals.*

143. These countries have for the most part the insects and reptiles. noxious or otherwise, of the neighbouring ones, and present in this department little subject for remark. The warm and moist, abound the most in flies, musketoes, and scorpions. Peshawur is famous for the last, but their bite is not mortal. During the spring months flies are very numerous, but before midsummer they are greatly diminished. White ants are but few, and in Cabul and the west, there are none. The musqueto is only troublesome in Cabul for about forty days of midsummer. Khoorasan in general is a dry and temperate country, and has few musketoes; but there are exceptions to the rule, and particularly Hirat and Seestan. The musqueto of Seestan is remarkably large and troublesome. It is pretended they are produced in the fruit of a certain tree, which is, however, not peculiar to that country. To escape their attacks, the natives sleep in what they call pusheekhanas, which are made of the cotton stuff, in Hindoostan called guzee, and which is either made in the country or imported from that to the west. The horses which have not this defence, are so severely bitten as to bleed from the effects, and roll themselves with the pain. The end of summer and the autumn is the season of the musqueto there, as in most other places. Wasps are most numerous in the cold countries. Snakes are found in all except the very coldest, but most of them are innoxious. Futihabad, between Jellalabad and Cabul, abounds in

<sup>1</sup> Continued from p. 900.



venomous snakes. The locust is found in these countries, but commits the greatest ravages in the warm ones and the open plains; it is commonly observed that they are brought by an easterly wind. Two seasons are yet well remembered in which these insects ravaged a part of Khoorasan. They have visited Cabul in this manner but once in the present generation.

144. The wild bee, of the kind which we have domesticated, is a stranger to Cabul, Khoorasan, and Toorkistan. Its nests are very common in the woods of Kushmeer, and beyond the Indus we find them as far as some parts of the Kafeir's country; in the south they are plentiful; at Bels, on the borders of Bulochistan, they are made on the branches of trees or shrubs, in the clefts of trees, or even on the ground, and contain as far as 30lbs. of honey and wax, but the average is only one-third of this amount. In the warm climates are two seasons of honey, one in May another in October, but the latter only is known in the cold. Two kinds of bees are distinguished, a smaller and larger. The larger has been chiefly domesticated in Kushmeer. A large earthen vessel is built into the wall of a dwelling house, care being taken to turn the mouth inwards, and to perforate the bottom of the vessel, by which means the bee shall have access to it from without. The mouth of the vessel is shut up, but so, that the owner may open it when he intends taking his share of the honey. Things being thus prepared, a colony of bees are introduced, and being fed on sugar, soon become reconciled to their dwelling. At the proper season the owner takes his share of the honey, and leaves a portion for the sustenance of the bees. The Kushmeerees leave them very little, but make some amends by introducing from time to time boiled pitha as their food.

145. Fish are an important article of diet only in Kushmeer, Sindh, and the neighbouring coast. The species known in our upper provinces, for the most part are found in the rivers of the Punjab and at Peshawur; in Kushmeer, however, the alligator and that other more dangerous animal which the Hindoostanees call *mugur*, never appear to enter the river, nor are they known in Khoorasan or Toorkistan. Khoorasan has few fish, even if we comprehend Seestan and its lake.

146. This lake is more noted for fowling than fishing. Among its reeds are great numbers of a web-footed bird, which the natives call ghoo, and catch in nets solely with a view to its feathers, which are used in stuffing pillows, and for other purposes. In all these countries ducks are found in a domestic state, but never in great numbers. At Tashkund geese are kept. The common fowl is much kept by the

pasturing tribes. In Bajour, the whole of Toorkistan, especially Bulk, and some other quarters, this bird is found in a wild state. The chief prey of fowlers is the bird in India called chikor. Some Indian birds are not to be found wild in Peshawur, far less beyond it, for instance the peacock, and that which the English call the adjutant. The parrot and myna are scarcely natives of Toorkistan, or at least of the country beyond the Oxus.

### *Quadrupeds.*

147. The brown ground rat of India is well known in many quarters of Khoorasan and Toorkistan. It prefers a sandy soil, and is a formidable enemy to growing or ripe crops. The musk rat perhaps does not extend to Cabul. The cold countries of Toorkistan and Khoorasan, excepting Hirat, have not the squirrel. The monkey and mungoose are also not found in the same countries, except in Kushmeer, to which the mole seems confined. Hedgehogs, porcupines, turtles, and tortoises are generally diffused, as is the hare. White hares are chiefly found beyond the Jaxartes. In Cabul only is the hare kept in a domesticated state, and they may be purchased in the market for eight annas. The rabbit is not found in these countries, India, or Persia.

148. A variety of the cat is bred in Cabul, and some parts of Toorkistan. By us it is very improperly called 'Persian,' for very few are found in Persia, and none exported. The Cabulees call this cat bubuk or boorak, and they encourage the growth of its long hair by washing it with soap and combing it. With respect to the other species of the cat genus, the tiger is found as far as Tashkund, but in that temperate climate he falls much short of the Bengal tiger in strength and ferocity. The lion is a native of Persia, and some are found as far as Tashkund, in a northerly direction and in an easterly. There remains no doubt of lions being found in Hurriana; but in many of the intermediate countries this animal is very rare. Neither the lion nor tiger is found in the cold climates, such as Kashkar and the Pamer. Leopards seem to prefer cool hills. They are very common in the Kohistan of Cabul, but they do not attack men.

149. The wolf attacks man only when urged by excessive hunger, and hence is the most formidable in cold countries and severe winters. The jackal is known every where, except in the coldest and driest districts. The fox of Toorkistan, and generally of the cold and temperate countries, has all the cunning of the English, unlike the puny fox of India. Chinese Toorkistan is the only market worth

mentioning for peltry, and thither are carried from independent Toorkistan, skins of the common brown fox, the black fox, the sable, the ermine, the beaver, and some other fur bearing animals. These are partly known in Khoorasan and Persia, but (except the brown fox) are not found in Cabul or Afghanistan in general. From Toorkistan are also carried the furs of young lambs, the best of which reach the court of Pekin. The lamb must be killed when a few days old.

150. The Mahomedans reckon the bear impure and forbidden, but find several uses for his skin. He frequents the vallies of cold hills, and especially if they possess a stream. In Kushmeer there seems to be two species, the yellow and black. He is scarcely found among the detached hills of Khoorasan. The hog prefers the plains, especially if shrubby. The Hindoos sometimes eat his flesh in secret. The Kafeir's alone eat bears. In Toorkistan young horses are fed up to be slaughtered, and the onager, where found, is eaten. The rude tribes eat flesh in general in a half boiled state, and sometimes raw. The ass and mule are no where eaten.

151. Among quadrupeds, the chief game are the various species of wild goat, antelope, and deer genuses, which pass into one another in such a manner that there is great difficulty in identifying the species from description. The goats inhabit the mountains, the antelopes and deer prefer the plains. Khootun is famous for its musk deer, which are known to be found in some parts of Tibet and on the Pamer. An inferior kind of musk is brought from upper Swad, or perhaps the country beyond it to the north. With respect to what the natives call wild sheep, they cannot be of the same species as any of the domesticated kinds, but are probably what zoologists call *ovis ammon*.

152. There is no reason to believe the existence of wild horses in any of these countries. The animal which the Persians call *goorkhur* is, I presume, the onager, or wild ass of naturalists. This animal is of incomparable swiftness but may be killed by art. He is common in Persia, the western part of Khoorasan, and the plains of Toorkistan, from which he extends north into the Russian dominions and the centre of Asia. A few are kept by the Ymaks more for curiosity than use. Before proceeding to quadrupeds strictly domestic, we may mention the *bos grunniens*, or ox of Tibet, which is found in a wild state on the Pamer and the upper parts of Budukhshan, and has also been domesticated by the Kirghizes, who frequent the Pamer. They keep a few of the common kind, but many more of this species.

*Domestic Quadrupeds.*

153. The horse of Toorkistan has long been famous, and forms the chief article of export from that country to Afghanistan, India, and Persia. From certain quarters in Khoorasan (chiefly the north-west) horses are exported to the same countries, but in less numbers. In both cases it is chiefly the pasturing tribes who rear this animal, which is but rarely housed even in winter, or in the cold country of the Ymaks; they are not very numerous in Bulochistan, neither are they found of remarkable goodness either in that country or in Afghanistan. In the neighbourhood of Bameean however, and some other parts of the north, is a breed of very strong and serviceable ponies. Those of Tibet are broader, smaller, and stronger. In the country of the Yoosufzyes, and some parts of the country between the Indus and Hydaspes, in Bunnoo and Daman, we find a breed of Tazee horses, which are much esteemed. Horses in Kushmeer are neither numerous nor good, but there are considerable numbers of ponies.

154. The ass gradually improves as we proceed westward from the Company's provinces. Perhaps the best are those in the west of Khoorasan, but even these are much inferior to the Arabian or the Spanish. Asses are imported into Cabul from Bokhara and the north-west of Toorkistan. Mules are scarcely raised in Toorkistan, the best are bred in Khoorasan; a slender species, but yet hardy, is bred in Pothwar and the neighbouring districts. They are raised in the vallies of Jajee and Foree, in Teera, and some other places.

155. Tibet, Kushmeer, Kashkur, Keerategin, Durwaz, the upper parts of Budukhshan and the Huzara country breed no camels, being too cold, moist, or rugged, for that animal. Beyond the Jaxartes is the two humped species, in the Toorkee language called *uzhree*, and by our writers, (I believe) Bactrian; his height is far less than that of the Indian camel, his hair longer, he is not capable of bearing severe heat, and is not easily naturalized even in Bokhara. In the kingdom of Kokun he is the prevalent species, but in some places neither is known. The camel called *bughdadee*, has also two humps, but his height is equal to that of the Indian. He is found chiefly in the south-west of Khoorasan, yet even there is much outnumbered by the Indian species. This species is very abundant in the whole of Bulochistan, in Sindh, and the borders of the Indian desert. In those countries soldiers are often mounted on camels, and some breeds are remarkable for their swiftness. The camel of Ghuznee and Cabul, originally of the same species, is now somewhat changed in his properties by the climate; he cannot bear the winter cold of these

countries, and probably exceeds the Indian camel in strength, but yields to him in patience of thirst and hunger. With respect to appearance, he is not so tall and slender in his limbs.

156. The Punjab, Sindh, and the Indian provinces of the Afghan monarchy considered as a whole, have cattle nearly in the same proportions as in our upper provinces, and the quality is not very different. In the detail we find great differences, the cattle on the west side of the Jumna are superior to those on the east, the oxen of Nagour and cows of Hurriana are much celebrated, even the cattle of the Punjab are probably superior to those of our provinces east of the Jumna; those of Peshawur are certainly inferior, and the cattle of Sindh are not remarkably good; yet great numbers of them were carried from Buhawulpoor by Tymoor Shah's army to Cabul, where the breed is still perceptible. The native breed of Cabul yields the most wretched bullocks, but considerable numbers are every year brought from Nasour by the Lohanees, and others who travel on the southern road to India. Cattle are brought to Peshawur from the Doval of the Hydaspes and Indus. In Seeweestan cattle are not numerous or good. In the middle and west of Afghanistan and in Khoorasan, they constitute no very considerable part of the national wealth. Being kept by farmers, their numbers are in proportion to the village, and hence they are more frequently found among the hills. The pastoral tribes of the open country keep but a few bullocks to carry their tents, the cow is therefore usually nouse fed, or fed on meadows and gardens near the village. Round the lake of Seestan, however, are seen great herds of cattle, which pasture on the marshy grounds. The cows of the west in general give more milk than those of our provinces, and in the Ymak country some give as far as fifteen seers; a very small breed kept by some tribes of the Kafeir's gives as far as twenty seers; the cows of Kushmeer give a great deal of milk of a poor quality.

157. The buffalo is not fitted for cold countries, hence he is scarcely to be seen in Kushmeer, notwithstanding its moistness; and by far the greatest stock is in Poonuch and Rajur and its other dependencies to the south, which have a much warmer climate. Far less is the buffalo suited to the climate of Cabul, which is both colder and drier, yet in both countries diligent search would probably discover a few. Buffaloes are numerous in some parts of the Punjab, and they give more milk than in the Company's upper provinces; as far thence to the north and west as the warmer plains and vallies extend, this animal is bred, but according to circumstances in greater or lesser

numbers. In Seeweestan sheep are the favourite stock, and in the Daman, cows. In the warm parts of Pukhlee buffaloes are very numerous, and in Swad and Bhooner they constitute the chief stock, yet are buffaloes not used for carriage in those countries. Beyond Jellalabad and Lughman, buffaloes are scarcely seen. The climate of the warm parts of Toorkistan and Khoorasan is certainly favourable enough to this animal, which is yet in a manner unknown; some are indeed seen near Candahar, and a few years ago several were kept in the neighbourhood of Milk. The buffalo probably extends from the delta of Sindh, west, along the coast of Bulochistan; but the whole of the inland parts of the west, and the whole of the hilly tracts of Bulochistan are destitute of this animal.

158. Sheep are kept in all these countries, nor does there appear to be in Bulochistan any tribe which depends on camels alone, like the Arabs of the desert. The sheep are of two breeds, easily distinguished; the heavy tailed (called doomba), and the light tailed. The latter species is that found in India, and thence extend west into Sindh, and part of Seeweestan. The sheep of the Daman are generally of this kind, which also prevails nearly to the utmost limits of Pothwar. In Kushmeer, Tibet, Kashhur, most parts of upper Budukhshan, and among the Kafeir's, no other is known. In such a tract of country many varieties must occur in appearance and value; the finest wool seems to be that of the Indian desert, and the Rajpoot country. The doomba is found in all the other countries; and is the prevailing species in Persia, with the exception of Geelar and Mazandarum. The doombas of Toorkistan, and particularly that bred by the Kuzzahs is very large. The doomba seems a superior species to the Indian sheep; the wool on an average is equal, the carcase larger, and the flesh richer flavoured. The lamb is reckoned one of the delicacies of the spring season. The pasturing tribes of the west do not in general suffer the ewes to lamb twice, but where sheep are kept by farmers in small numbers an autumn lamb is dropped, which however does not thrive so well as the spring one. In Kushmeer, the environs of Cabul, and most other places where the sheep are housed in the winter, only one lamb is had from the ewe, but in the upper parts of Budukhshan a contrary practice prevails.

159. Every flock of sheep ought to contain a few goats, which lead the way in pasturing. In some countries goats and sheep are nearly equally mixed, but some situations are so steep and rugged, that sheep cannot accompany the goats. Where it is practicable to keep them, sheep are a more profitable stock. The goats of these countries present

some striking varieties ; black is the most common colour, but those of the mountains from which issue the Beah and Sutluj are generally white. The goats of the Kafein's have sometimes very long horns, curiously twisted ; those of the Wuzurous have sometimes long horns, and each horn twisted as it were round itself, like the pillars of Jewish architecture. In that great range of mountains from which the Ganges and Jumna flow, we find even as far as the left of the Indus a breed of goats of great size and strength, and the natives employ them to carry commodities on roads not practicable to any other beast of burden.

160. In the Punjab the same animals are employed for carriage and burden as in our provinces, and the properties are nearly the same. Elephants, become rarer and rarer as you proceed westward. Beyond the Indus an elephant draws as many spectators as an European. In the Doab of the Hydaspes and Indus, mules are a good deal used for carriage. In Sindh, the countries bordering to the east of the Indian desert, and Bulochistan, camels are the chief beasts of burden, and are cheap and good. With respect to the other countries, we are to distinguish carriage as it may be. 1st, that of armies ; 2nd, that of caravans or of persons making distant journies ; 3rd, that of farmers on their own farms, or for the supply of provisions to towns, or distribution of town manufactures in the neighbourhood, or the interchange of commodities, within small or moderate distances. The chief carriage of the Persian army is by mules and strong ponies. The latter are by no means so esteemed as the former, yet by reason of their cheapness are actually found in the proportion of sixty or seventy to one hundred of the whole. All other carriage is but inconsiderable. Bullocks are not used except for dragging artillery, a use they are also put to in the Doorany army. In both countries it would be much more advisable to employ horses. Certain of the Loor tribes employ asses, and officers of rank who may have heavy baggage keep some camels ; were it not for these last, the motion of an army would be scarcely impeded by its baggage, for the camp followers who do not in number exceed the fighting men are almost to a man mounted on the sumpter animals of their masters. This constitution of their army must alone give the Persians infinite advantages in a war with Hindoostanee forces, incumbered with multitudes of timid attendants, and impeded by a sluggish baggage. The Afghans, intermediate in situation between those two nations, adopt in part the usages of both, in this important particular, camels however are certainly the chief carriage of their army, which generally makes slow marches. On oc-

casion of emergency, however, it is known to leave its baggage behind and make very long ones. The small armies now on foot on the sides of the various competitors for the throne use, it is probable, more mules and ponies than camels, and perhaps many years may not elapse before the former species of carriage gain much ground; the poverty alone of the soldiery now prevents its more general adoption. Runjeet Singh has made some progress in providing mules for part of his forces, but his situation is not favourable for procuring those of the most serviceable kind.

161. For long journeys the camel is the most economical carriage, and in caravans they outnumber all other animals. There are however some exceptions; the trade to Chinese Toorkistan from whatever quarter, seems to be conducted by means of ponies and horses. Commodities brought by the people of Toorkistan to Cabul are almost all on horses, but such of the inhabitants of this side of the mountains as trade to Toorkistan mostly use camels. The trade from Peshawur to Cabul, and Cabul to Peshawur, is carried on by means of all the various beasts of burden in the country; perhaps an equal weight of commodities is annually transported on camels, mules, and ponies. Some bullocks, originally Indian, bring loads from Cabul, but seldom return, being readily disposed of in Peshawur. Bullocks are little used for long journeys, except in the cases already mentioned (see paragraph 160); a few attend the army besides those of the artillery. With respect to the third species of carriage, it would lead into great details to particularize the usages of all the various districts, for within a short distance is often the greatest diversity of practice. On farms, in a vast majority of cases, the chief carriage is by bullocks. The intercourse between the towns and the neighbouring country, is as much by means of other animals, except in the quarters towards India. The wandering tribes in general have their tents carried on camels, but where, as in the west of Toorkistan and north-west of Khoorasan, they drink from draw-wells, the leathern bucket for drawing water is carried by an ass or a bullock. The tents of the Ymaks in general are carried on ponies and horses, but the Jamsheedus use a good number of bullocks. In the upper Sindh and lower Punjab, asses bring the greatest part of the fuel into towns. Asses bring great quantities of grain from Bajour into Peshawur; in the former country camels are scarcely known, although the soil and climate is not unfavourable; there are still fewer in the moist country of Koonur; asses are of much use in the internal traffic of both, and in the country of the upper Mihmuds. In the plain of Peshawur, bullocks are mostly used in bringing grain



to the town, but camels and mules are employed in longer journeys. In Puklee many mules are used. The internal trade of Toorkistan is chiefly by ponies and horses. In some parts of the east asses are much used, but in Keerategin men transport the greater quantity of goods. Nor is that species of carriage peculiar to this country, but is known in Budukhshan, Durwaz, Kushmeer, and in the countries within the great mountains which bound India to the north. A considerable proportion of the goods carried from Peshawur to Kashkur through Bajour or Punjokhora are for some distance conveyed on the backs of men; it is needless to observe that the roads are of the most difficult kind.

162. The animal most commonly used for ploughing in these countries is the ox, and in some of them no other is used. A circumstance which greatly recommends them, is that no other servant is required besides the drivers, whereas for all the other animals a man is required to lead. On the other hand, a single bullock is but very seldom found equal to this work; but where the soil is light, a horse or camel is sufficient, these have also the merit of greater celerity, which may in some cases be much required in farm management. Accordingly horses are in part used over most of the open parts of Toorkistan, and by the Ymaks. In Muro scarcely any other animal is used. The use of horses in the plough, perhaps, extends to some of the other parts of the north of Khoorasan, but in all other quarters of that vast country it seems unknown, and in the other countries under review, I presume very few instances of it are to be seen. The Khirghizes plough on the Pamer chiefly by means of bullocks of the Tibet species, already mentioned, but in other quarters they use camels. The Kuzzaks employ camels almost solely. The Tureens and Buruhes use both camels and bullocks. A proportion of camels is used in certain parts of the Kokur dominions, and a few in Seeweestan. In Beekaneer and the neighbouring countries, camels are used, but not so much as bullocks. It may be presumed that camels are much employed in the warm parts of Bulochistan, but among the hills bullocks are almost solely yoked. In the neighbourhood of Mooks and Abilazee, places in the road between Candahar and Ghuznee, it is not uncommon to see the fields, which are commonly light, but with a mixture of stone, under plough by a couple of asses. In Seeweestan two asses are sometimes yoked.

163. Bullocks most commonly draw water, whether it be fetched up by a rope and leathern bucket, or by the action of a wheel. Yet are camels sometimes used in the country of Beekaneer, and in others in or near the Indian desert, and always with good effect, one bringing up the bucket from the deepest wells. The Toorkmuns near the Oxus,

water their fields (for they are not ignorant of agriculture) by raising water from cuts which are made from that river, and in this operation they usually prefer the wheel, with a band of water pots, and yoke camels. Such wheels are, towards India, sometimes seen turned by buffaloes. In such quarters of Toorkistan as horses are yoked to the plough, they are also made to draw water, and camels are in use for the latter as well as the former. With respect to the treading out corn, the same animals, camels excepted, are used, as in the respective places where they are yoked to the plough, cows however, although useful in treading out, are scarcely so in ploughing. Goats too may sometimes be seen in Pushing, assisting in the former operation; which in Cabul, Khoorasan and Toorkistan is not always effected by the feet only of the animals, but by the addition of some simple machinery.

164. It must excite surprise to learn that carts are unknown in the greater number of these countries. In the line of the Embassy's march to Peshawur, they were found not to extend to the right of the Indus. There are few, perhaps none, in the dominions of Mohummud Khan on this side the river, but to the south they are used in most parts of Sindh as far as we may suppose their use demands. Carts are but little used in Seeweestan, and not at all in any part of Afghanistan, the remainder of Bulochistan or Khoorasan. In a westerly direction we may proceed nearly to the Hellespont before we see any. Neither are any found in Toorkistan on the south of the Oxus (with one exception) Bulochistan, Kashkur, Keerategin, Durwaz, the Pamer, Kushmeer, or most parts of the Dooab of the Hydaspes and Indus. In the neighbourhood of Bokhara, Orgunj, Samarkand, and Kokur alone are carts used in Toorkistan beyond the Oxus. In Bokhara they are not employed for all the purposes they are applicable to. In this particular, as almost all others, our information is very scanty respecting Chinese Toorkistan. I have been lately informed that carts are very much used in that quarter, and some have as many as six horses yoked to them. The Chinese in Yarkund and the other cities use buggies and tandems, not unlike those of the English, hence there is some probability that the use of the humble, but more useful species of wheeled carriages is not unknown. In most parts of Toorkistan, and probably in many other quarters, great use is made in rural operations of a machine which seems to be a sledge.

*(To be continued.)*

ART. III.—*Journal of a Mission from the Supreme Government of India to the Court of Siam.*

*December 18th.*—At half past 1 P. M. left Maulmain. My baggage and presents for the Court of Siam in three boats; and at half past 2 P. M. halt ten minutes at Neaung-ben-tseik, when having ascertained that the elephants (six), which are to meet me at Nat-Kyning, had started about 8 o'clock, we proceeded with the flood tide in a south-easterly direction up the Attran river, passed the villages of Nantay, Keik-poron, Keik-mo-rong, Peikh-hnay-cong, Kan-ta (or Kanaumy), Being-beo, and at 6 o'clock halted for the night at Keik-mare. The banks of the river, which winds considerably through an alluvial country, have been low and wooded throughout the day.

*December 19th.*—At half past 2 A. M. left Keik-mare with the morning's flood, and continuing the same course as yesterday, passed several rocky (lime?) hills, and at 8h. 45m. halted for breakfast at the village of Attran, near the old city of that name. The neighbourhood of this village is said to be favourable for cotton cultivation, and the teak forests commence in detached clumps on the right, or eastern bank of the river, about Pa-baung, (a village inhabited by Shan elephant hunters), a short way below it. Complaints are said to have been made to the court of Bangkok of the number of elephants stolen from that kingdom, a little north and east of the capital, and sold into our territory; some of these hunters have been summoned to Bangkok, others have been recalled by the chief of Timmay, to which place the majority of them belong, and the rest are said to be preparing to follow them: in the meantime, strict orders have been issued by the court of Bangkok, prohibiting the exportation of elephants from Yahine, (the southernmost of the Laos towns), and the country to the southward. Left Attran at 11 A. M., and at 1 P. M. enter the Zimee river, where it is joined by the Wengeo, their united streams forming the Attran. The Zimee is exceedingly tortuous in its course, the different reaches running to every point of the compass. At 2h. 25m. P. M. halt for dinner, having come from Attran against the stream, which is very sluggish at this season; 4h. 15m. start again with the flood, and reach Kea-en (lotus lake) at 10 P. M., here we halted for the night; the inhabitants of the village are Kareens, who have fled from the oppression of the Birmans in the last year.

*December 20th.*—Left Kea-en at 8 A. M. on the flood, and reach Nat-Kyaung, at 10 A. M., where we got the things out of the boats, and

wait for the elephants which have not arrived. Nothing can be more uninteresting than the banks of the Attran and Zimee, winding to every point in the compass, through an alluvial soil with banks of considerable depth, and covered with rich arborescent vegetation to the water's edge. After passing the villages on the first day, nothing is to be seen from the boats except an occasional solitary alligator, gnanah, king-fisher, or snake bird. We met three rafts of timber, in all about 260 pieces, floating slowly down the stream. The river though of great depth, having upwards of three fathoms opposite our halting place, can discharge only a very small quantity of water from the small declivity in its channel, consequent sluggishness of its course, and great height to which the tide reaches up it. Though the most productive river in the provinces in teak, its timber, particularly that of the lower part of the river and near its banks, is held in less esteem than the Irrawadie or the Malabar timber; the depth and great richness of its soil promoting its more rapid growth, and hence diminishing its strength and elasticity; our people have however in the last year overcome some difficulties in the Memlunghe river, which have opened a mine of wealth to the provinces in the splendid teak of that river and the upper Salween, if the Siamese government throw no obstacles in the way.

*December 21st.*—The elephants arrived to-day at noon, having been detained half a day by one of them following a herd of wild ones in the night: we have been employed apportioning their loads, and preparing for an early start to-morrow. The tigers are said to be excessively bold in this part of the forest.

*December 22nd.*—Goonghe-let-tet, 5h. 50m., sixteen miles. Started at 7h. 40m. A. M. leaving the banks of the Zimee, and travelling along a well trodden path used by the timber cutters, reach the Kareen village, Nat Kyeaung, of ten houses, at 8h. 35m., where we were detained an hour in endeavouring to procure guides, all the Kareens declaring they knew nothing of the country a mile south-east of their own village. I had unfortunately no one with me who spoke their language, and though they all spoke Talines, and many of them Birman, they are only to be properly managed in their own language; and it is not to be wondered at, for they have never had any communication with their neighbours for ages, except to be oppressed or cheated. We at last prevailed on three of them to accompany us, who brought us safely to this halting place, protesting to the last that they knew nothing of the road. At 10h. 15m. cross a small nameless stream. 11h. 15m. Goongalay, another stream. 12h. 5m. cross the small stream of

Danoung. From 1h. 5m. till 2h. 5m. travel up the bed of a small stream, then cross the Thaybue; and at 2h. 20m. halt on the bank of a small feeder of the Goonghe, a considerable stream, on the banks of which there was formerly a town of the same name; it runs through a rich and level teak tract, and the timber is floated down it in the monsoon into the Zimee. The path has been good throughout, level and dry at this season, and even in the rains must be very passable; there is but little teak timber near the path, none good, and no sign of inhabitants after leaving Nat-Kyeaung. The soil a rich alluvion, well adapted for the cultivation of coffee and cotton.

*December 23rd.*—Goonghe, 5h. 40m., eleven miles. Left the last ground at 8h. 10m., and almost immediately entered a teak forest; the trees were nearly all killed for felling, generally of small scantling, interspersed with other trees, and an underwood of small bamboos; the soil generally hard, with small nodules of iron-stone in the paths, which form little water courses in the rains. None of our party knew the proper road, the Karcens to whom I trusted as on former occasions persist in denying all knowledge of the roads in this direction; the head elephant driver having been employed here in dragging timber, had a general knowledge of the forest, we were consequently obliged to put ourselves under his guidance, and with the elephants in front making a road where there was none, reached this halting place, on the banks of the Goonghe mentioned yesterday. The water in it this season, is here twenty paces across. One of the coolies was taken ill with fever yesterday, soon after passing the Kareen village, and as he has not come up, I hope he has returned there. Ten or twelve traders of those who started with us, unable to keep up, are encamped three or four miles in the rear, and as our means of carriage are limited and no rice procurable, or village to be seen for seven or eight days, our want of rice will hurry us on as fast as the elephants can march. I have sent the Siamese interpreter, one mahout, two Karcens, and two bearers for rice, and a guide to the wood cutters in the forest, about six miles westerly of our halting place. The path is nearly a dead level, in some places broad and clear, in others there is scarcely any traces of it; at one time for an hour and a half, had to cut our way through a bamboo jungle; passed two small streams, feeders of the Goonghe, and two small lakes in the course of the march.

*December 24th.*—Metakut-let-tet, 2h. 50m., seven miles. Were detained looking after one of the elephants till 11h. 10m. at the last ground, and had then to force our way, nearly the whole march, through an underwood of low bamboos, without any signs of a path,

except when here and there, for a short space, some of the numerous wild elephant tracks with which the whole forest is intersected, took the direction we wished to travel. No teak throughout the march. Soil as yesterday firm, and mixed with small stones, but of considerable depth, as seen in the banks of the small streams, of which we crossed three or four in the course of the march. The path, but for the jungle, would have been good, and was dry throughout; our detention this morning enabled the traders and our people (who went in search of the guide, and who were unsuccessful) to overtake us before we started.

*December 25th.*—Meetakut, 7h., fourteen miles. The whole character of the march and country the same as yesterday, excepting that at 9h. 40m., an hour and a half after leaving the last ground, we found ourselves on the top of a small hill, from which we saw that we were surrounded by low hills, giving an undulating character to the country; and the latter part of the march has been a little less level than for the last two or three days; a few of the teak trees of more considerable size than any we have before seen; crossed during the march five small runs of water, all tributary to the Zimee, and saw in the jungle, marks of all the larger inhabitants of the forest, bison, buffalo, cow, elephant, hog, elk, deer, &c., jungle and pea-fowl, all along the line of our march.

*December 26th.*—Meetakut river, 1h. 40m., five miles. Were again detained by the straying of one of the elephants in the night, till 12h. 45m. Twenty minutes after starting entered the teak forest from which much of the timber in the Maulmain market has hitherto been supplied, and came on a wide and good road by which it has been dragged to the river, partly by main force by the elephants, and partly on trucks. The teak at first scattered wide apart in single trees, becomes a little more numerous as we approach the river; but they still form a very small part of the forest; the timber larger and finer than we have hitherto seen. At 1h. 40m. reach the river, running in a deep bed in rich soil; though there is a considerable depth of water in many parts of the river, the bottom is so uneven as to prevent the timber being floated down, except in the rains. From this we march in an easterly direction, come again on the river at 3h. 10m. when we cross and halt on its banks, being a considerable distance from any other water. We have been fortunate in obtaining a basket and a half of rice from some wood cutters, at three rupees a basket. The Kareens who still accompany us know the road for the next two days; we shall then for one day have, as in the last few days, to take the best direction we can. when several of the people know the road to Kataintsein,

the Siamese post on the frontier, at least they have travelled in this direction some years ago.

*December 27th.*—Kyeun-Kyaung-let-tet, 4h. 20m., eight miles. Left the last ground at 7h. 45m. and march generally in the direction stated, though the route has been very tortuous, over broken ground through a forest of tall trees, with an underwood of bamboos so broken down and interlaced by the wild elephants, that our progress was exceedingly slow, excepting for about a mile, when our march happened to lay along a wild elephant tract. There has been no signs of any path throughout the day, and the elephants did not come up till past 7 P. M. Saw only a few teak trees just before coming to our ground, which were nearly all killed for felling, though we saw no stream that appeared adapted for floating them to the river. The soil appears good, though broken by many wild ravines, and water by no means scarce, but no sign of this part of the jungle ever having afforded subsistence to a human being. Marks of the same variety of wild beasts as yesterday.

*December 28th.*—Near the Zimee, a little above Kyeun-Kyaung, 3h. 10m. A. M. nine miles. Start at 8, along a small path, the same as yesterday; at 8h. 25m. cross the Maz-Pra, or Ko-tor Kuag, a branch of Meetakut, about which there is a good deal of fine teak, and the path begins to be well marked; at 8h. 50m. cross a small stream and an old Kareen clearing; 9h. 40m. cross another small stream; at 9h. 50m. come on the road by which timber had been dragged in the monsoon to the Kyeun-Kyaung, which we reach at 10h. 10m.; passing down in the direction of the stream, come on it again at 1h. 20m., where it joins the Zimee; passing up that river, ten minutes halt at a wood cutter's hut. The Zimee is even at this season of considerable width, and has at this place and season five or six feet of water. We obtain another basket of rice, price three rupees, and gain information about the road between this and Jung-Jung-Khay; a great deal of very fine timber still in this forest close to the river.

*December 29th.*—Small stream, 6h. 50m., two miles. 9 A. M. left last halting place, where there are the stumps of a teak stockade still to be seen which was erected 1147, (A. D. 1812) by Along Min-dora, the grandfather of the present king of Ava, on his expedition against Bangkok, but taking a road too much to the eastward got into ravines, quite impassable for people with loads; from their steepness and the thickness of the jungle, we were obliged to return to the ground we had left, and at half past 12 took a fresh departure, and marching along at a short distance from the banks of the Zimee,

halted here at 2h. 40m. The teak here appears to be confined to the valley of the river, as not a tree was to be seen after entering the hills; the road we attempted to find in the morning would have taken us to Jung-Jung-Khay in one day, whilst by the one we are now pursuing, we shall be three or four in reaching the same place. We procured two guides at the last halting place, who had come up to float down timber, but finding the elephants and people they expected to have met here, had returned to Maulmain, their engagement with Mr. Darwood being cancelled, they also were about to return. Their occupations keeping them about the banks of the river, they are acquainted with our present route, and supposed from description they could have found the eastern road, but unfortunately were mistaken, and being very short of provisions, we could not lose time in looking for it. Our party have feasted on elephant's flesh the last two days; the people at the halting place having shot a female the day before our arrival, the flesh of which they were smoking for the Maulmain market.

*December 30th.*—Maitsalic Kyeung 1h. 30m., three miles. Have made wretched progress the last two days; did not get the elephants, one of which had followed a herd of wild ones, till past one o'clock. We started at 1h. 20m., and after marching ten minutes, had to halt twenty, till the guides went to look for the path, amongst many others, nearly all equally trodden by the wild inhabitants of the forest. At 1h. 50m. proceeded for another ten minutes, and had again to halt an hour for the same purpose, when we a third time moved forward, and at 3h. 5m. reached the Zimee, running a clear stream in a stony bed, with banks in a direction N. 20° W., waist-deep at the ford, and some 150 yards wide; crossed it N. 55° W., and marching along its western bank through the teak forest (of Mr. Bentley) reach this ground on the Maitsalic river, knee-deep, running N. 6° E. to join the Zimee. Here we were obliged to halt for the elephants, as it is impossible to distinguish the path even with help of the full moon; we have only one more day's rice, and shall certainly not get a supply for the next two days.

*December 31st.*—Small stream, 4h. 20m., eleven miles. Started at 7h. 35m. and crossing the Maitsalic twice, proceeded by a tolerable path through high tree jungle, and enter a narrow valley with a small stream, at 8h. 35m., which in twenty minutes becomes a ravine; along this ravine the hills more or less high, and more or less receding. Our route lay till 10h. 22m., when we recross the Zimee at Waat-tan-glie (where it has a northerly course) in direction N. 60° E., the stream pretty rapid, and the water about three and a half feet deep; after crossing we waited for the elephants which we had left at



10h. 5m. ; they did not overtake us till 1h. 5m. No one of our party having ever marched between this and Jung-Jung-Khay, we had some difficulty in finding the path, which we could only distinguish, amongst the numbers of wild elephant tracks which cross the forest, by the few marks of the traveller's knife on trees at long and uncertain intervals. At 2h. 35m. we lost all trace of these and our path at the same time, which after unsuccessfully seeking for an hour and a half, were obliged to return to a small stream we had crossed at 2h. 5m., and at four halted for the night ; some of the people just at dark, discovered the path on the east side of the stream. No teak timber since entering the ravine, on the other side of the Zimée, a good many thengan trees of great size, and other trees very high, with rather fewer bamboos. The wild elephants from their tracks, seem exceedingly numerous in this part of the forest, and the first of our people saw a herd to-day on the other side of the river.

*January 1st, 1839.*—Halt. The neighbourhood of the innumerable wild elephants has caused us an inconvenience I have feared for some days ; one of our elephants joined them in the night, the mahouts having been in search of him all the morning, returned after noon, having lost all trace of him on a bare hill some miles distant. I immediately (after furnishing them with a portion of our very small quantity of rice) despatched them again with other elephants, and to my great joy, they returned about 6 o'clock having reclaimed him. We have of course been constrained to halt here to day ; I had however in the forenoon despatched the Siamese interpreter, some bearers, and some Birmans for a supply of rice, to meet us at the next halting place ; they will I hope, finding we have not arrived there, come on to meet us, as there is not a grain of rice in camp for breakfast. I have tied up the elephants to night, and shall continue to do so till we are out of the vicinity of the wild ones ; this arrangement will enable us to start early in the morning, and give the elephants the whole afternoon to feed, they can then be tied up, and branches cut for them ; though they suffer from this plan when long continued at this season, when there is little succulent food for them ; we shall in a few days be where we can let them loose at night.

*January 2nd.*—Karaung-tan. 5h. 20m., fourteen miles. By tying up the elephants last night were enabled to start to-day at 7 A. M. The first part of the march was over a broken country, repeatedly crossing a stream about ankle-deep ; the jungle at times a little more open. At 10h. 30m. were much disappointed at coming on the place where our party sent off for rice had slept last night, giving us little hopes of any thing to eat to-day. At 11h 10m. come on the Meeka-that, running

in a deep ravine, with a high rocky hill E. ; travel up its bank, and at 12h. 10m. cross it just below the water-fall, of Jung-Jung-Khay, little more than knee-deep. The fall we saw was not more than three or four feet, but a little higher up there is a fall of much greater height ; the stream divides some way above where we crossed, and forming a small island, joins again a short way below ; the branches are of nearly the same size, both of which we cross ; we then pass up it to the west, and at a short distance from it, at 12h. 20m., cross the Karong-tan, running down to join the Meeka-that ; and at 12h. 40m. halt on the east side of the stream, about the same size as the Meeka-that. The people sent for rice have not returned, and the elephants and one-half of the rest of the people have not been able to come up, so that the party here to-night amounts in all to only sixteen or eighteen, and had it not been for a wind-fall of some yams in the jungle just before halting, we should have had nothing to eat ; as it was, there were only some small knives to dig them with, and the depth the roots run in the earth is about three or four feet ; my tent is also in the rear.

*January 3rd.*—Three Pagodahs, 4h. 10m., ten miles. Elephants and people did not come up till 8 o'clock, when having breakfasted on the roots mentioned yesterday, and fern-leaves, we left the ground at 10 o'clock, and marching along a good path, over ground a little undulating, with a high precipitous hill east, at 10h. 35m., the jungle composed of high trees and nearly free from underwood, halted at Enganoo, a small run of water at the foot of a descent from the road, a little after one, to dinner ; as I was told there was no water at this halting place, and I wished to pass the night here, to enable me to get an observation of the distance between the moon and a star. Started again at 4 o'clock, march along a good path in high tree jungle, with occasional patches of bamboo underwood, till 5h. 10m., where some rocks protrude through the surface and the rocky hills at a short distance east of the path ; 5h. 20m. pass some water ; and 5h. 40m., just as it was getting dark, lost our path, and with some difficulty by firing muskets which were answered by the mahout (the elephants not having halted as we did), in half an hour reached the three Pagodahs, over broken, rocky, wet ground ; the sky became clouded, and we had a few drops of rain till 10 P. M., when the night became beautifully clear. The ground on which the three Pagodahs, so called, though they are only three heaps of loose stones, are situated, is of considerable height, being the centre of the range. The water on the opposite side runs in opposite directions, marking the old boundary between the Siamese and Bir-mans ; the water on the eastern, or Siamese side, falling by the

Thaung-kala into the gulf of Siam, and on the western, or (now) British side, by the Zimee and Attrán into the gulf of Martaban. The ground is rocky and barren, only a few stunted trees, some bamboos, and long grass; under a belief that no water was to be found here, we had halted in the afternoon to make our miserable meal, had in consequence been benighted, and tumbled about amongst the sharp, broken, rocky ground near the halting place, where on arrival we found an abundance of good water for a much larger party than ours, which will probably not be dried up for the next two months.

*January 4th.*—Thaung-kala, 3h. 10m., nine miles. Waited this morning at the three Pagodahs till past nine, when the moon went down, in hopes of getting a distance between the sun and moon, but anxious as I was to do so, I was defeated in my object by a thick fog which rose just before the sun, and continued till after the moon had set. It was impossible to make a day's halt, as the people had already been three days without food, except what they picked up in the jungle, and I did not know when I might expect the party despatched for rice, as we passed their previous night's halting place about noon, the day before yesterday. At 9h. 20m. we started, the elephants having gone an hour or so before; at 10h. 45m. heard some one in apparent distress calling out to the right of the road, and on going to see what was the matter, found a young elephant had taken fright, at some of the people running up behind him, and broken away into the jungle, knocked off his rider, and breaking his howdah and all its fastenings against the branches, had escaped. I sent all the people who could be spared from the other elephants after him, they picked up all his load, consisting of a large carpet (part of the presents) and some muskets, but being unable to see him, we left the things in the jungle, and started at 1h. 25m., intending to make all haste to the halting place, and send the elephants back to look for their lost companion; but we lost the road at 1h. 50m. and we did not find it again till 3h. 20m., when we continued our march, and crossing two or three runs of water came to this ground, on a beautiful mountain stream about knee-deep, and a stone's throw across, running here south-west, and falling into the gulf of Siam, and were much disappointed at not finding the people with the rice; the elephants from the thickness of the jungle in one or two places, and from some fallen trees over a ravine in which they had to march, did not arrive till 8 p. m., when it had been quite dark in the jungle for nearly three hours; they were enabled to find their way (fortunately the path was pretty well marked towards the end of the march) by the mahouts carrying in front immense torches of blazing bamboos in

a bundle over their shoulders, which gave an exceedingly picturesque effect to the whole little encampment. It is now impossible to send back for the carpet, and should the wild elephants come upon it in the night they will certainly tear it to pieces, our lost elephant will also have an opportunity, and as I believe he has not been in bondage above eight or nine months, he will probably be admitted into the herd, and having nothing to distinguish him but his belt, (should that fortunately not be torn off in his rushing through the jungle,) I fear we have not much chance of recovering him. I shall however halt here to-morrow, send one of the horses for rice to the Siamese Kareen village of Kenk-khaung, and all the elephants after the fugitive one. The path to-day has generally been good and level, through a high tree jungle, and occasionally in a ravine, always with high hills at a short distance, and our course more direct than on any previous day.

*January 5th.*—Halt on the Thaung-kala. About 4 p.m., the party sent for rice returned with a most welcome supply of two baskets, enough for two meals for the whole party; the Siamese interpreter to whom the money was entrusted, after a vain attempt to get the others to join him in withholding it from the villagers, separated from them and has not yet returned; the head mahout who was of the party, bought the small supply we have obtained with his own money, and the Tsokay of the village promised to bring us an elephant load to-morrow; he told the mahout the king would punish him if he received payment for the rice, but he would take what I chose to give him as hire for his elephant. I had already despatched two elephants for the load of the fugitive one, and immediately the rice arrived I sent the three others with the head mahout and a supply of rice for three days to look after him, with directions to return in that time, whether they recovered him or not.

*January 6th.*—Halt at Thaung-kala. About half-past 4 the Siamese interpreter returned with the Tsokay of Thaung-kala, who according to his promise to my people yesterday, brought me three baskets of rice, some salt and chillies; he received one rupee for the rice, and I gave him and the chief person who accompanied him two cotton handkerchiefs each, with which they were very well pleased; he had accompanied some Siamese officers with a letter to Maulmain some time ago, and professed to recognize me, I believe however I was in Calcutta at the time he refers to. I had just given up hopes of him, and supposed the interpreter, from what I had been told yesterday by the people who accompanied him, had very probably gone off to Tahine, where he has a wife and children, especially as he had received an

advance of two months' pay, and ten rupees for the purchase of rice ; he says, he supposed (I know not on what grounds) we were at the three Pagodas, and was on his way thither, when he saw the party looking after the lost elephant. The supply of rice was a most seasonable relief to the people ; five or six Madras men who are not accustomed to jungle food, had yesterday considerable derangement in the bowels from living on the green fern leaves and roots, it has nearly gone off again with the improved diet.

*January 7th.*—Halt at Thaung-kala. The party sent after the elephant returned at 8 o'clock this morning, and as I had feared, without him ; the wild elephants are so exceedingly numerous in this part of the forest, that from the first I had little hopes of recovering him ; a short way in advance of the place I had followed him to, he had rushed down a ravine so steep and rocky that the other elephants could not follow him ; they went round, and coming on his track on the further side, followed it till they came on a herd of forty or fifty elephants, and our smaller one would not approach them ; the head mahout on the only one that would, broke the herd in hopes of seeing our lost one, as the wild ones will not admit one escaped to mix with them ; he however was not seen, and in hopes that they might come on him making his way back the road he came, and in that direction, they went back as far as Jung-Jung-Khay near which they fell in with two other large herds, but had no better success in the search, and from the time they fell in with the first herd, they of course, in the numerous paths made by the wild ones, lost all trace of his foot prints. The interpreter has just told me he saw a Tsokay of Pra-Soowan, who has charge of this district, to whom he gave an account of the number of people, elephants, &c. I had with me, and told him I was sent on a mission with a friendly letter to the Court.

*January 8th.*—Neauny-hen, stream near a Kareen village of the same name, 5h. 10m., fifty miles. Left the Thaung-kala at 8h. 30m. our course a little more to the southward than the general direction of our march hitherto ; path nearly level, but apparently between two ranges of hills, and crossing four small runs of water, feeders of the Thaung-kala, 11h. 15m., the path lay near the foot of a high (5 or 600 feet) precipitous rocky hill, bearing N. 40° W., with its steepest side towards the south eastward ; 12h. 20m. came to an old clearing and cotton field, with a small run of water ; we halted, seeking the road, half an hour, from this in five minutes we reach Alanday Kyung, running S. 6°, 5° W. nearly as large as the Thaung-kala which

it joins. The Thaung-kāla is joined near the same place by Meene-Kyning, which rises in the hills near Yea, where the three take the name of Ka-tain-tsein; further south the Mag-nan-noi, which rises in the hills towards Tavoy, joins it, and though smaller gives its name to the united stream. At 1h. 30m. we cross in a few minutes a rather steep hill bearing S. 60° E. near the eastern part of which a road runs N. E. to Kenk-Khaung, the residence of the Kareen Ank of this district; south of his village he has about seventy houses under him, who pay each a tax of fifty viss of cotton. At 3h. 35m. having halted an hour, reach this ground. Just before halting, the Taung-thoo traders who accompanied me, and who had come on to this village yesterday, met me with a complaint against the interpreter, who had told the villagers they were not part of the mission, and not to sell them any rice; he must have heard the complaint, for one of the coolies had given him half a rupee to bring rice, this he gave to the Kareen, and directed him to tell me that he had said they were traders, and to sell or give them rice if he had any to spare; the Kareen gave this version of the story when I inquired into the complaint, and as soon as he got home, the interpreter went and demanded the half rupee or a basket of rice; the Kareen returned the money, and then told the truth, expecting I would make the man pay him back the money. I shall however henceforth supply the whole of them with rice, which will save a great deal of trouble.

*January 9th.*—Papan Kyuing, 2h. 10m., seven miles. The elephants which were unable to come up last night, have again obliged me to take up my quarters under a bamboo bush; they did not overtake us till 12h. 10m., when having hired an elephant from one of the Kareens, to carry the load of the lost one, agreed to pay the half of his price if they recover him, which they expect to do. We started having procured three days rice, and given a pass to the Taung-thoo traders who separate from us here, and propose joining again in Bangkok. The country was a good deal broken throughout this day's march, and the hills apparently at no great distance, but the jungle so thick that we could not see twenty yards in any direction; we crossed two small streams immediately after quitting the last ground, and at 12h. 55m. Raja of Kyuing, knee-deep, passed two or three other small streams, and at 2h. 30m. halted at this one, to enable the elephants to come up, which they did just before dark. The Kareens have been civil and furnished us with rice, the only thing they had, as they rear no poultry nor pigs. A Taline visited us this morning from one of the military posts, the name of which, and apparently the name only, is still kept up; he

put some questions to us relative to our number and arms, but no hint was dropped of delaying us ; some mystery was made about the road, and an attempt made to induce me to go by Tauny-Kahoung road, but assuming a perfect right of choice, I merely intimated my intention of going by Ta-kanoon, which is shorter, and nearly level, whilst by the other the hills are very steep. One of our Kareen companions is at this moment giving most ludicrous and savage imitations of the dances of the Siamese, Taline, Birmans, and Sawas by the fire-light.

*January 10th.*—Sa-di-diang, 3h. 10m., nine miles. Start at 7h. 55m. and crossing the small ravine, in which the Pa-pan runs, proceed along a small reedy valley, through which the road has only been allowed to pass since our peace with Ava, before which time it ran east of the hills. At 8h. 10m. we passed a small trench, said to be the site of an old Siamese stockade, and the elephant pits (Ka-tyne-tsein,) from which the river and a frontier post and stockade on it take their name ; at this post during the whole fine season was kept a force of from eighty to one hundred Talines, and twenty-five in the rains ; the whole of this path is said to have been strewed with Birman corpses in 1147 (A. D. 1812) when Along Mendora invaded Siam ; his force was marching in an extended line, almost from Thaung-kala to Ka-tyne-tsein, when the Siamese broke his line near Neaung-ben ; the king with the rear fled, leaving the van in the hands of the Siamese, who with the barbarity always displayed by both nations whenever they had an opportunity, tied them five or six at a time to the trees and speared or shot them. At 8h. 40m. cross the lesser Ka-tyne-tsein river, knee-deep, from which the country is more open to the west, the hills to the eastward continuing ; at 9h. 35m. cross the Ka-tyne-tsein, over the saddle flaps, some six miles below the old stockade now given up ; 9h. 50m. cross the Paway, knee-deep, falling into the Ka-tyne-tsein, on the banks of which we fell in with a herd of wild buffaloes, one of which the Kareens wounded, but he got away ; at 10h. 40m. enter the clearing of Sa-di-diong, the name of the Tsokay, pass two small villages both bearing his name, and halt here in the same clearing at 11h. 10m. We met some Kareens to day, who found fault with our guide for bringing us this way ; he answered that we knew the road, and would not come by the hills. Our present halting place is one of Pra-soo-one's villages, his people amount to seventy families, paying a duty yearly of fifty viss of cotton, carrying it as far as Camhoorie, for which they may make a money payment of five Siamese rupees (about six rupees and a quarter Madras) they have also to find carriage and food for officers passing this way ; they met the chief who came to Maulmain last year at Ta-

kanoon and took him with provisions as far as the Meeka-that. There are forty men liable to be called on for the public service, and thirty exempt from youth, age, or other disability. Pra-soo-one receives 60 rupees, each of the Thooghees 12, and one or two Key-danghees 6 per annum from government; the Thooghees and Tsokay are excused the tax. Every Kareen I have asked, and I have asked a great many, have come from the Martaban district, at some period or other, to escape from the Birmans; all the grown men and some of the lads speak Talines fluently. Three of the people ill with fever to-day from the night dews and cold.

*January 11th.*—Jungle, small streams, 3h. 20m., nine miles. Left Sa-di-diong's village at 9 A. M. and crossing the stream, proceed till 9h. 30m. when we ascend a rather steep hill for eight or ten minutes; at 10h. 20m. 10h. 40m. and 11 o'clock cross three small clearings and a village, and three small streams; at 11h. 40m., after another ascent, saw to the N. a range of high hills running E. and W., halted here at 12h. 30m.; road generally good but must be now at some elevation; passed at a "call" distance from a lake of two gun-shots long, said to be full of particularly large alligators.

*January 12th.*—Oulaung 3h. 30m., eleven miles, started at 8 A. M. and march along the somewhat level top of a hill for half an hour, with hills (which we can see from this elevation) on all sides, at 8h. 30m. descend for ten minutes, when we enter a narrow valley or rather ravine, along which the path lies in high tree jungle and bamboos; crossing four or five small streams, at 9h. 20m. ravine opens a little, and we pass an old clearing; at 10h. cross the Taung-Kapauny, a stream of about half a leg deep, then march twenty minutes or half an hour in a ravine, in its bed or close to the brink; at 10h. 50m. pass an old village, and an extensive clearing; at 11h. again enter the ravine, which continues to near this Kareen village of Oulaung, so called from a small mountain torrent of that name, and on the bank of which we are encamped. The path is good at this season, and well frequented; in the rains it must be soft and muddy in some places, but perfectly passable, and the Kareens say it is used at all seasons. The guides from the first village of Neaung-ben left us at Sa-di-diong, and those from that place left us here; the inhabitants of this village also speak Talines, and most of them are from the Martaban province. The Thooghee is from the old city of Haundro; the tax is the same as that of Pra-soo-one (to whom they are not subject) but I could get no account of the numbers, the Thooghee says four or five families, but from the extensive clearing, there are proba-



bly more; as they have no market for the paddy or cotton, they probably cultivate no more than enough for their own subsistence, clothing, and tax; they almost all possess elephants; a female one is worth from 80 to 180 rupees, the males are somewhat dearer.

*January 13th.*—Way-pee, 2h. 35m., eight miles. Left the last halting place at 9h. 20m. and crossing the Oulaung three or four times, proceed along its banks; at 10h. pass a small clearing, and at 10h. 50m. ascend for five minutes a stony hill, after crossing which the ground is broken till 11h. 30m. when there is a small space more level, with a high range (6 or 700 feet) of hills running away north on the western side of the Katern-tsein or Mime Kyning, which we cross here, at Ta-ka-noon, a Taline post of three or four houses and two large granaries, one without a roof, and neither having any grain in them; indeed the frontier duty is now a sinecure. The chief of the post was an uncivil old Taline; he took down the number of the people, muskets, elephants, horses, and a rough list of the presents, which detained us till 12h. 25m. when we crossed the river waist deep, which occupied a quarter of an hour, continued our march till 1h. 20m. when we halted on the banks of a small stream near a Kareen village; had some discussion with the people at Ta-ka-noon about the road; they insist that the eastern road from this to May-nam-noi has not been used for some years, and that it is two days march from this place; the western road is well frequented, and also occupies two days; it is inhabited by Kareens, and level, which the other is not; we have consequently come the western road, for which they furnished us with a guide, a simple little old fellow, whose head I have decked out in a gay handkerchief, and out of whom I think we should have got the truth, had they been attempting to impose on us about the roads. The elephant hired at Neaung-ben village returns from this, where we get another; path to-day pretty good, altogether amongst the hills.

*January 14th.*—Dat-katein, 4h. 20m., thirteen miles. Started at 8h. 25m. and crossing a hill of some height, come on the river at 9h. 25m. running in a ravine, perhaps 300 feet below us, near which our route lay, up and down hills with gradual slopes, and passing two old clearings, about 10h. enter the May-nam-noi district, at 11h. pass a Kareen village, where we obtained the first fowls we have seen since leaving the last village in our own territory; at 12h. 30m. leave the river, near and above which we have marched all the morning, entirely amongst the hills, a high range of which hills run nearly north and south on the other side of the river, beyond which lies the eastern road before mentioned, which the Kareens have deserted, and come west since we have occupied the provinces; at 1h. 30m. come

on a stream of water ankle deep, which after running along the road and overflowing the jungle for a short way on both sides of it, disappears most unexpectedly through the apparently solid earth ; near this we are obliged to encamp, muddy as the water is, there being no other within three or four miles ; elephants come up at 6 P. M. ; the path to-day has been a succession of hills of more or less elevation, generally near the river, which often runs in a ravine with an occasional platform on which paddy or cotton have within the last few years been cultivated by the Kareens, who say that till after our late war with the Birmans, this part of the country, as being too near the frontier, was not inhabited, and consequently this road never used ; we are now only five or six days from Tavoy, as the Kareens travel.

*January 15th.*—Soo-gua, 8h. 40m., two miles. Were again detained till half past 4 P. M. by the straying of one of the elephants which had crossed the river in the night, and was found about two or three miles on the eastern side of it ; started immediately, and came to this village, it being impossible to proceed, as it was very dark, and the path through a high forest not being distinguishable ; we had a high range of hills to pass on leaving the last halting place.

*January 16th.*—Ke-dean, 3h. 50m., twelve miles. Started at 9 A. M. and marching through a continuation of the bamboo jungle in which more or less it is intermixed with jungle trees, we have marched with little interruption all the way from Nat Kyeaning ; we have seen no teak on this side of the hills, nor have I found the Gamboge, Tola, or Sapan tree, all of which I had expected to meet with here, the former are said to abound near the sea-coast, and the last is found in abundance on the See-sa-wet river (two days east of this) which falls into this river near Camboorie ; the Taline refugees and captives are employed in cutting it annually two months in the year, but in transporting, collecting, and carrying it to Bangkok, they are always occupied six months, and are obliged to furnish to the king fifty pieces, four cubits long, and a span and a half thick ; for any above the proper quantity they have an allowance of 1 tickel, for 50 viss, and any deficiency they must make good ; the selling price in the market is 1 tickel a piece ; they may compound for this service by paying 20 tickels. I heard to-day of some tyrannical restrictions on the internal traffic of the country, which I shall hear more about at May-nam-noi, where some of the exactions are made. A story is told as a good joke of two officers who were sent up to Taline lately to inquire into and punish those engaged in stealing elephants, which are sold at Maulmain ; on the night of their arrival the two elephants they brought with them from Bangkok were stolen, and have not since

been heard of; the thieves of Bangkok are said to be perfect in their calling. The path to day has been more level than we have travelled since leaving Sa-di-diong's village, and open to the eastward, the western hills continuing. We have passed some small Kareen villages with their clearings, crossed one stream of water, and passed at 10h. 30m. a spring from a rock, which after running in a small stream for a few hundred yards, is lost in the same way, as that near which we encamped on the 14th; at 1h. 40m., we passed the paddy and cotton fields of this village, the most extensive we have seen; the cotton now ready for gathering, very good, long in the staple, and pods large. At 2h. halt near the village of Ke-dean, of six houses. Elephants came up at 6 p.m. Saw at Kenny Ena (so called by way of distinction having a Kenny or convent) a very handsome elephant, with tusks at least 7 feet long, belonging to the Poonghees.

*January 17th.*—Roye-tsong, 3h. 10m., nine miles. Started at 10h., having been again detained by the same elephant which crossed the river two nights ago; march along a jungle path, the same as before, pretty level throughout, but rocky in the first part of the march; passed only one run of water, but a considerable extent of paddy and cotton ground, in all eight clearings, the last of considerable extent. None of the Kareen villages I have seen or heard of in this part of the country contain more than five or six houses, generally only three, but the houses are long, and several families live under the same roof; each family has however always a separate ladder up to the long verandah which runs along the front of the house opposite their own compartment. There are here, as in the Tavoy province two tribes of Kareens, whose languages are different, but intelligible to each other. About two miles from this halting place we passed the Kareen village of Ka-way, at least the female portion of the inhabitants are Kareens, the husbands are Talines, and were on duty at May-nam-noi; some of the gold washers who are sent out annually by the king were in the act of pillaging their house, as we passed; our approach saved the poor creatures' little property, though all Amhoo-dans, or people employed by the king, whether in cutting timber, washing for gold dust, or what not, receiving no pay, commit larceny by the royal licence. The present depredators were Laos people, though the Talines who are employed in the Sapan forests and the king's troops have all the same privilege; the order extends only to provisions, but nothing is said to come amiss to them, and the small officers; for the Talines who are employed as soldiers are the wood cutters, and have a boat following them the first few days on the river, which when filled with plunder they send home to their fa-

milies; villages in their line of operation are likewise exposed to their tender mercies. The line of our march has been at no great distance from the river, and on its banks we are encamped to night; we have all day been surrounded by hills on all sides, except to the north-west, the jungle a mixture of trees and bamboos as heretofore; the only tree of any value we have seen is the Kanean, or oil tree, a considerable number of which we have passed in the last two days, towering as they always do far above the highest trees in the forest, with their beautiful straight stems and light green foliage; many of them reach a height of fifty or sixty feet without a branch.

*January 18th.*—May-nam-noi, 2h. 50m., nine miles. One month from Maulmain. I had calculated on being in Bankok in twenty days, and we are still eleven days from it; we have lost several days, by the loss and straying of the elephants, and want of guides in the uninhabited forest, which it has been the policy of the Siamese and Birmans to keep between them. Had all circumstances been most favourable, it would have been impossible to have accomplished it in any thing like the time I anticipated, travelling as I have done with elephants, and obliged for days to cut away the interwoven branches to allow them to pass. Left the last ground at 8 A. M. and travelling for about twenty minutes through the old clearing near which we had encamped, reach the river near which we march for ten minutes, when the path takes a direction more to the westward, and we commence the ascent of the hill we have seen to the S. W. of us for the last three days; the passage of the range occupied about an hour, the path, after those I have travelled to the N. E., by no means steep or difficult; at the bottom of the hills to the southward, after crossing, we came on a path more travelled than any we have seen since leaving the Meta-keet teak forest, leading the west to Tavoy, which may easily be reached from this with elephants in five days, the road is said to be generally hilly and difficult in some places; at 10h. 20m. after passing a new clearing we came on the river again, where we cross and halted here in a shed prepared for us on the shingle (its bed) by the Myotsa of this place, who soon after we halted came to my tent, and remained for upwards of an hour; he brought a basket of rice, some vegetables, dried meat, cocoanuts, &c., for which he refused to receive payment; about 1h. 30m. the elephants came in. The May-nam-noi, from which the lower part of this river now takes its name, has its source in the hill somewhere east of Yea, and falls into the Dayeik, or Dareik, by a deep rocky ravine of not more than a few yards wide, opposite the present small frontier post of the same name. The old city

of Dayeik, or Dareik, of the old maps, is situated on the banks of the latter stream, about half a day above the junction of the two; it is now destitute of inhabitants, but as we are much less troublesome neighbours than the Birmans, the present Myotsa, who is a Taline from Kaling-Aung in the province of Tavoy, has received the royal order to re-establish it with Talines, who he says will be allowed to bring their wives and families here with them; this is however in my mind very questionable, for the king with good reason, fears the Talines would return to their own country if they could once get so near it, with their families. I here found six thugs who arrived fifteen days ago, having made their escape from the Tavoy jail; I requested Myotsa to give them in charge of the Siamese officer now on his way from Bangkok to Tavoy, promising the allowance of 10 rupees a head for them when returned to Tavoy; he said he could not give them up without a royal order, and if he could, the officer would probably not receive charge of them; a good deal was said pro and con, and he at last agreed, at my suggestion, as he could not take care of them (having only come here to meet me, and see to my provisions, &c. and being again about immediately leaving to return to Be-lank-Kyeung to wash for gold) to send them to Camboorie, as it is probable I shall there meet the officers who annually visit Maulmain and Tavoy from Bangkok. I declined receiving charge of them, having no means of preventing them making their escape, and told him I should at all events demand them at Bangkok, and he must hold himself answerable that they were forthcoming, this he readily promised, and was altogether very friendly and civil; he also provided me with a boat, in which to send some of the heavy things, and some sick people to Camboorie, at which place it will arrive at the same time that we shall, the river being so tortuous that it takes five days with the stream to reach Camboorie from this place. In the course of the afternoon some twenty boats with the Laos people from Chandapoorie, who were taken prisoners by the Siamese in their cruel destruction of that place about twelve years ago, passed up on their way to the Belank river to wash the sand for gold; last year was an unsuccessful year; the number of people employed amounts in some years to 2,500, they are employed three months, and are ordered to produce a maximum of one tickel each of gold, all over which they are allowed to keep; some only get a half, some a quarter, others less; they are all sworn to give in all they have obtained on their return to Bangkok; few make up the tickel; they have the same licence as to provisions as the Taline wood cutters, and it was a party of them who

plundered the village near our last halting; the old Myotsa came after sunset with an invitation for me to stay here two or three days; I was however told he only wanted the credit at Bangkok of having been civil to me, I accordingly, which I should however have done under any circumstances, declined remaining, and pressed him again about the convicts; he repeated his promise to send them to Camboorie.

*January 19th.*—Bang-tee, 4h. 6m., twelve miles. Having started the boat with the tindal, and some of the heavy presents, and discharged the hired elephant, left our halting place at 9 A. M., and at the top of the bank passed the village of May-nam-noi, consisting of four miserable bamboo houses, that of the Myotsa not to be distinguished from the others, and surrounded by the remains of the old stockade, which has not been repaired for many years; proceeding not far from the side of the river, through a bamboo jungle and over broken ground, passed a small Kareen village at 9h. 35m., and at 11h. 15m. cross the river (now named May-nam-noi) running here N. 20° E. on a sand bank in the middle of it; after crossing the river saw a few teak trees, the first on this side of the hills, and had a glimpse of a herd of twenty or thirty wild buffaloes, noble looking animals; at 1h. 40m. halted here in a thick jungle, surrounded by hills, on a small brook, which passes through a ravine to join the May-nam-noi; path has been good all day, particularly in the teak forest; gave the old Myotsa who has been exceedingly civil, a small carpet at starting this morning.

*January 20th.*—Weing-wee, 4h. 10m., nine miles. Started at 8h. 20m. and march for an hour over broken irregular ground, surrounded by hills which frequently approach so close as to form rugged ravines; we then came on the bank of a small stream, or rather a chain of lagoons, where we waited an hour for the elephants to tread down the strong reeds, of twenty or thirty feet high, with which the narrow ravine is filled to the foot of the abrupt, broken stony hills, to enable us to pass; this continued till noon, where again, after a short ascent, we came amongst the stony ravines and narrow valleys of the limestone hills; at 1h. 30m. came to a small clearing, and at 2h. halted here near a deserted Kareen village; the family only removed a few yards, and built a sand pagoda three feet high to propitiate the Nâts, having been frightened away by the very ominous circumstance of some mushrooms sprouting up in the fire place. The path to-day has been the worst we have travelled, which is accounted for by the people from all the communication between Bangkok and May-nam-noi being carried on in boats; if more frequented it would of course be better, but no traffic could make it a good road; there is another road on the eastern side of the river, which the Myotsa of May-nam-noi told our

guide was the best of the two, but water was scarce by that route ; the guide told us he did not know the other road, and so brought us by this one, it however turns out that he does not know this one either, and has to trust to a boy who came to accompany him back to his village. Had a visit from a tiger last night, strange to say the first since leaving Maulmain.

*January 21st.*—Ta-ta-kan, 4h. 30m., thirteen and half miles. Started at 9h. and ascend gently along a pretty good path for half an hour, where an equal descent brought us to the bottom of the low hill, where crossing a small stream springing from the rocks close to the road side we enter a small level, covered by prickly bamboos ; the eastern hills recede here, and our route lay near the foot of those to the south-west till 12h., when ascending the debitus (nearly all the hills to this have been limestone) at the bottom of the hills which are composed of red sandstone, very steep, and perhaps 700 feet in height, march along a rocky path, and through a short ravine, crossing one small run of water, till 1h., where we again came to the level, reaching to the river, across which our route lay till 1h. 45m., where we halt on the western bank of the river opposite Ta-ta-kan ; the Myotsa, for it is still dignified by the title of city, having once I suppose been entitled to it, came over immediately and invited me to a Tay he had erected for me close to, or rather over the water on the other side ; as however an unnecessary loss of time would have been caused by crossing the river, the best road being on this side, I thanked him for his attention, but declined crossing the river ; he was satisfied and very civil ; he brought some eggs, cocoanuts, and a basket of rice, for which he refused payment ; he was born here, but his father was Myotsa of Maulmain, in which he had about forty houses in the time of Tsen-bue-shen, son of the great Alom-pra who ascended the throne of Ava about 1744 ; he receives sixty tickels a year from the king, and is one of nine Myotsas under the Camboorie May-won, six on this and two on the See-sa-wet, and one between the rivers, all Talines, except Pra-sa-one of Kienk Khaung, who is a Kareen. The Kareens are said to amount to 1,000 under Camboorie, who pay each fifty viss of cotton ; the village of Ta-ta-kan contains only seven houses, and the stockade, which was of bamboos, is quite in ruins ; the river is here about a stone's throw and a half across, about five feet deep, and very sluggish, with high banks on both sides. The path to-day has been good, and generally level ; from this there is a path west of Tavoy ; our boat and also the six thugs have passed down ; of the latter I am told there are eleven more at Camboorie.

*(To be continued.)*

ART. IV.—*Remarks on the Geology, &c. of the country extending between Bhar and Simla.*

TO G. R. CLERK, ESQ.

*Political Agent, Ambala.*

SIR,

In reporting my arrival at Ambala, I beg leave to lay before you an outline of the route I have followed, and of my proceedings. From Ambala I proceeded to Bhar, and from thence traversed the Pinjore valley as far westward as Nallaghur; I then ascended the mountains en route to Ballaspore per Ramghur. In this tract I passed over a series of rocks, consisting principally of sandstone, slate clay, limestone, and trap, a particular account of which I shall afterwards take the liberty of laying before you. Close to Ballaspore I crossed the Sutledge, and proceeded along its banks for some distance. Being still unsuccessful in finding an out crop of coal, I prosecuted my search towards Mundi.

In the Mundi territory, near to the village of Tuttepoore, coal occurs, agreeing in mineralogical characters with the canal coal of Britain, &c., and if it could be found in quantity, would be well adapted for steam vessels, &c. I regret however to state, that the advanced state of the season, and other untoward circumstances prevented me from carrying on my investigations.

That coal may occur here in quantity, is probable from the circumstance of its being found in the same formation, and associated with the same rocks as the coal beds of Britain, &c.; and the specimens which I have brought to Ambala, equal to a maund, shew that it will be well adapted to the purposes for which it is so much required. I hope therefore another opportunity will be granted, in order that I may finish my examination, seeing that there is so much probability of success; and if I am successful, I might then direct my attention to the route by which the coal might be transported to the banks of the Sutledge. I would feel particularly indebted, if you lay my statement before Government, and if in accordance with your views, with a request that leave may be granted at some future period for finishing my inquiry.

AMBALA,  
30th Jan. 1840.

I have, &c.,

(Signed) W. JAMESON.

(True Copies)

(Signed) G. CLERK. *Poll. Agent.*



## REPORT.

The observations which we are now about to offer, being made during the most unfavorable period of the year, viz. July, scarcely a day passing in which our investigations were not interrupted by rain, are far from perfect; we hope however when the season is more favorable we will be allowed to resume them.

In the mean time our remarks will be principally confined to the country extending between Bhar, and a few miles beyond Simla. By means of the road sections and the numerous streams which occur, the country here has been well opened up, rendering its examination comparatively easy and satisfactory in general, in many places however, from the various alterations and dislocations, difficulties of no ordinary nature are encountered.

The field which we are now about to enter on, although frequently trodden by travellers, has never as yet engaged the particular attention of any geologist, a remark which applies nearly to the whole of the Himmalehs. Thus it has been lately remarked, "*We possess but little information as to the general direction and dip of the strata of the Himmalehs; even the principal geognostical features of the various formations are scarcely at all known to us.*"\* No doubt some remarkable statements have been made, and none more so than those of Mr. Gerard, who mentions that he met with fossil shells, in alluvium, at a great height, as fresh and entire as if they had recently emerged from their *own* element; and that just before crossing the boundary of Ladak and Bussahor, he found a bed of *antediluvian oysters*, clinging to the rock as if they had been alive, and that at 16,000 feet above the level of the sea. Well might the author of the Geognosy of India conclude his remarks on the above, with the observation, that verification of this is expected.† It is a statement truly remarkable, and well worthy of the attention of future travellers. In an address lately delivered to the Geological Society of London by its late distinguished president,‡ we have the following remarks, "that Captain Grant in his account of Cutch, and Mr. Malcolmson in his description of a large portion of the Indian peninsula, have not ventured to call strata which they have examined, by the names which describe European formations." If any thing has been proved by geological investigations, conducted in the different quarters of the globe, it is, that in every country the rocks composing

\* British India, vol. III, p 316.

† British India, vol. III, p 326.

‡ Addressed to the Geol. Society, London, Feb. 1838, by the Rev. William Whewell.

the older formations present such a similarity to each other, as to render it impossible to point out any specific distinction. Thus Humboldt has made this remark, in regard to the rocks occurring in the Andes,\* discovering no difference between them and the European of the same comparative ages. The same remark has been made† and pointed out to us by Professor Jameson, which is amply verified by the extensive geological collection brought together from all quarters of the world, consisting of upwards of thirty thousand specimens deposited in the Edinburgh Royal Museum; nor have we met with any rocks among the Himmalehs, differing from those we have seen in Europe.

That the newer formations exhibit in different countries, different characters, we were entitled, a priori, to infer. Thus the American tertiary deposits, as has been proved by the researches of Rogers, &c., are quite different from the European; but it has been shewn from the first time these deposits were described, that they, in their distribution, were circumscribed, hence the name given to them by their discoverer Werner, of local deposits.‡

In extent, the Himmalehs are calculated to be upwards of 2,000 miles, running in a north-east and south-west direction. In such a vast extent of mountainous country, we have the individual mountains assuming all variety of forms, varying according to the nature of the rocks; thus we have peak-shaped, conical, dome, round-backed, saddle, table, &c. To pay attention to the form of mountains in connexion with the rocks which compose them, is of the greatest consequence, it being a well known fact that the shape varies with the rock, and an experienced geologist can, with a good telescope, distinguish, and that too with great accuracy, what a distant country may be composed of.

From the different countries through which this mighty chain runs, it has received various names. Thus its continuation to the west has been called Hindoo Cosh, which by Humboldt is considered as the continuation of the Kuen line; of the Macedonians, it was the Emodus; and the Imaus of Pliny; it probably also, in those days, was called Himmalehs, as the Greek title was borrowed from the Sanscrit.§ In its prolongation to the eastward, according to Colonel Kirkpatrick,

\* Humboldt on the superposition of rocks.

† Appendices to Capt. Ross and Parry's Voyages, and Cabinet Library, vols. Polar Regions, Africa, &c.

‡ Cuvier's Theory of the Earth By Professor Jameson, Notes to 5th edition.

§ Journ. Geograph. Soc. vol. IV. p. 63.

it is called Humla to the north of Zumila, and beyond the Arun, according to Hamilton's map,\* appended to the History of the Goorka war, the Harpala mountains. † Klaproth and Abel Remusat have collected from Chinese writings, the continuation of the chain in the snow-clad peaks to the west of Young-Schan. These turn abruptly to the north-west on the confines of Hon-Konang, advancing ultimately, according to Von Humboldt (who seeks in description, geography for the evidence of the elevation of mountain chains on longitudinal fissures) to the sea, and terminating in the island of Formosa.\*. We shall afterwards take an opportunity of inquiring into those views of Humboldt, and point out the observations upon which they are founded, being interesting not only to the geologist, but also to the geographer. To make a geological survey of such a vast extent of country, even if permission were granted to traverse many of those tracts inhabited by barbarous, half civilized, and jealous tribes, is a vast undertaking, and would be the labour of many years. The researches of Humboldt, Ehrenberg, &c. have laid open to us a great part of western Asia; of the countries between it and India proper, we possess but little information, and that we owe to Burnes, Bell, Sterling, &c.; we have here therefore still a great desideratum.

For many years the Himmalehs were considered the highest mountains in the world, lately however it has been proved by an observer of well known accuracy, Mr. Pentland, that they are surpassed by some of the peaks of the Andes; of the passes, the lowest, the Tungmug, is calculated to be 13,739 feet, and the highest, north-east of Koonawur, is 20,000, which allowing the culminating points of the chain to be 28,000, would give a relation of the main height of minimum of crest to the culminating point of  $1 : 1 : 6 \frac{6}{8}$ ; † Humboldt many years ago reckoned it at  $1 : 1 : 8$ .

In regard to valleys, it has been stated, that the direction of the *principal valleys* is in general at right angles, or perpendicular to the central or high mountain chain; whether this is the case in regard to the principal valleys of the Himmalehs, is a question; at present we are inclined to believe that they are not, and that they are parallel to the central chain, and thus forming those kind of valleys properly denominated *longitudinal or parallel*.

In groups of chains of mountains, as in the Himmalehs, it has generally been shewn, that there is a central or high mountain chain,

\* Journ. Geograph. Soc. IV. p. 63.

† Journ. Geograph. Soc. p. 63.

from which shoot at right angles smaller chains, named *principal chains*, and that between these the principal valleys occur; subordinate to these, we have other mountain chains, running at right angles, or perpendicular to the *principal*, and termed *secondary chains*, and the valleys between these, *secondary valleys*. That however does not appear to be the grouping of the mountain chains among the Himmalehs. Here we have the principal, secondary, tertiary, &c. chains running parallel, as already mentioned, in regard to the valleys to the central or high mountain chain;\* as examples of valleys running parallel to the central chain, we may give the Dehra Dhoon, and the Punjore Dhoon. The appearance presented by many of the small lateral valleys is remarkable, occupying the upper two-thirds, or half of the mountain, and forming that kind of valley, which has been denominated "Coorie"† In the neighbourhood of Bunnassur, there are many fine illustrations. Another very remarkable appearance is presented by the valleys first pointed out by Bourquet, as occurring among the valleys of the Alps, viz. *salient* and *re-entrant* angles. In regard to this appearance in the Perynus, Raymond says, which is quite applicable to many of the valleys between Bhar and Simla, "that the angles so perfectly correspond, that if the force which separated them were to act in a contrary direction, and bring their sides together again, they would unite so exactly that even the fissures could not be perceived."

On ascending the mountains towards Simla, and in fact in every direction, an appearance is presented, which strikes much the attention of the traveller on his first visit, we allude to the terraces on the acclivities, bases, and summits of mountains, resembling much the parallel roads of Argyleshire, so ably described by Sir T. Dick Lauder,‡ they however, like the Scotch, are not parallel to each other on the opposite side of the valleys, and moreover they occur every where.

\* Physical Geography is at present but in its infancy, the description of the form and grouping of mountains is but imperfectly understood, and much neglected. In books of travels, the vague descriptions given in general, are quite beyond comprehension. In this country scarcely any attention has been paid to the subject, though presenting probably the first field in the world for observation. We shall afterwards inquire into the age of mountain ranges, based upon their parallelism, a supposition first advanced and ably defended by the celebrated Beaumont, when we have examined more of the Himmalehs, which will allow us to compare this mighty range with those on the European, American continents.

† Imagine an oblique truncation, partly hollow in the upper two-thirds, or half of a mountain, and we have the appearance represented.

‡ Sir T. Dick Lauder's explanation being generally so well known, it is useless for us to notice it here. See Trans. of the Royal Soc. Edinburgh

throughout the mountains. That they have been produced artificially by man, is evident from these two facts, it is also the method adopted in cultivating the mountains at the present day; we never however, (at least very seldom) see cultivation carried to the summit of mountains, which appears generally to have been the case in former times, shewing that husbandry must have been carried to a much greater extent by the former inhabitants of the hills. There is another fact pointed out to us by Mr. G. Clerk, which goes far, if other evidence was wanted, to prove, that the terraces generally were produced by artificial means, viz. that in those places where they are well marked, we never see old trees, and again in those places where there is not a vestige of them, we meet with trees of great dimensions, pointing out that in all probability these tracts were unworthy of cultivation, and that therefore any thing was allowed to grow; in general where the latter occur the acclivity is steep.\*

In regard to the different parts of a mountain. The *foot* among the Himmalehs is generally found, owing to the steepness of the *acclivity*, to occupy but a very small proportion; the *acclivity* is always the most extensive part, its angle varying from a few degrees, to the mural. The *summit* in general is very steep, and frequently truncated, if we may be allowed to use the expression. *Soil*. The superincumbent soil, from the nature of the rocks, is in many places very good, presenting a rich vegetation. It is of two kinds, transported and untransported; of the former, we have five examples in the valley ascending from Pinjore to Bunnassur, being in many places upwards of 150 feet in thickness, and with boulders, many of an enormous size, of rocks quite different from those we meet with in the neighbourhood. In crossing Hurreepore bridge, and ascending towards Subbathoo, there is another fine example. That these are transported soils, is evident, not only from the nature of the boulders which occur, embedded; but also from their form being always rounded, shewing that they must have been brought from some distance, and subjected to considerable attrition. Into the age of these deposits we shall afterward inquire, our examination as yet being of too trivial a nature to allow us to speak definitely. It has been

\* Dr. Griffith in his account of the mission to Boutan, states, that he found many of the "lower mountains curiously marked with transverse ridges." These he further adds, "have much of the appearance of ancient terrace cultivation, but on inquiry, was assured that such was not their origin." He does not give any explanation as to the manner in which they were produced; probably, however, they may have been found in the same manner as the Scotch parallel roads. For Dr. G's remarks, see Journal of the Asiatic Society. New Series.

stated to us, that in the first locality, bones of fossil animals have been found, either imbedded, or in the neighbourhood. If the first statement should turn out to be correct, of which however he is doubtful, it may probably be the means of allowing us to draw conclusions in regard to the age of these deposits generally throughout the Himmalehs. To these transported soils we therefore beg to direct the attention of observers; of the latter, or untransported soil, we have of course abundance of examples. In many places it is of great thickness, as has been shewn by some sections lately made at Simla on the road from Subbathoo to the village of Draw, it also occurs in many places, of great thickness. This kind of soil is formed by the decomposition of the subjacent rock, or rocks and vegetable matter, and contains in general imbedded angular fragments of the rocks which occur in the neighbourhood. In regard to boulders, it may be stated, that there are two kinds, which may be denominated *natural* and *artificial*, the former produced by decomposition, the latter by attrition. To account for boulders in many cases on the summit of mountains, many erroneous statements have been made, and absurd theories proposed, which would have been avoided if the author had paid attention to this, and examined the mineralogical characters of the boulders, and of the rocks in situ; for instead of finding that the boulders had been brought from a distance, it would have been discovered, that they were in their original position. In trap and granitic districts, these natural boulders are frequently met with; in the former, caused by the oxydation of the iron, which enters more or less into the composition of all traps, and frequently in its least oxydized state, and thus tends to combine with more oxygen; in the latter, by the decomposition of the alkali of the felspar (generally potassa) a substance frequently found in the felspar of granites;\* the earth which remains is the celebrated Porcelain earth. To find trap on the ground scale exhibiting the columnar structure, and each of the columns composed of a series of balls, is not unfrequent. It is in these districts we meet with so frequently natural boulders of trap; if we examine minutely into the structure, we shall find that the concretions are

\* Analysis of rocks is a subject, which has as yet engaged but little attention; we are glad to see that one chemist in this country (Professor O'Shaughnessy) is paying some attention to the subject; it will amply repay his trouble, opening up a wide field of discovery, and at the same time giving to geologists the means of validating or refuting many of the theories, in regard to the formation of rocks which have been advanced. We hope therefore the Professor, who in his splendid laboratory has every thing at his command, will take the opportunity of conducting operations upon a more extensive scale and at the same time give quantitative analysis.

arranged in concentric caurellæ, and as these are decomposed from the cause already mentioned, the natural boulders are found. To find artificial boulders at great heights among the Himmalehs, is not uncommon; their distribution, and how caused, we shall afterwards inquire. Vegetation in its distribution among the mountains presents very extraordinary characters—thus that of the south side of a hill is quite different from that of the north; moreover the grouping of trees in the two aspects is quite different. On the northern they become much sooner shrubby, and disappear, than they do on the southern. This is amply proved by the observations of Mr. Gerard, for a copy of which we are indebted to Dr. Macleod.

*Springs.*—In regard to the temperature of springs, all those we met with were of the same temperature (or a little lower) than the surrounding air. Having made these few preliminary observations, which will prevent much repetition in the series of memoirs about to be offered, and of which this may be considered the first, in order to elucidate the geology of the Himmalehs, we shall now direct our attention more particularly to the subject. The rocks met with between Bhar and Simla, belonging to two grand divisions, viz. the *secondary* and *transition classes*, the latter, transition, may be subdivided into the older and newer, or the transition properly so called, and the *Silurian formation* of Murchison, a term lately given by this distinguished author to a series of slates, sandstones, and limestones, lying between the old red sandstone and grey wacke series, or, in other words, a mere extension of the latter, according to the views of Professor Jameson. To Mr. Murchison however much credit is due, for the able and luminous manner in which he has elucidated these rocks. By him they were first discovered in South Wales. In Scotland this so-called formation had been long known, though not considered entitled to another denomination; they have also been discovered in various parts of the European continent. In Asia Minor, Mr. H. Strickland stated to us, that he had found a large series of rocks as their equivalents. In India they have never as yet been noticed, although they seem to occur in vast abundance among the Himmalehs, at the same time, exhibiting characters similar to those met with in Wales, judging from hard specimens\*. Their extent we have not as yet been able to ascertain; it must how-

\* The specimens we allude to were in the possession of our friend R. J. Hay Cunningham, who brought them from particular localities in Wales mentioned by Mr. Murchison. In the Museum of the Royal Society Edinburgh there is a collection presented by the discoverer, but so uncharacteristic, as to be quite unfit for reference.

ever be great, judging from the abundance with which they occur between Bhar and Simla. In Sect. I, which points out the formations generally, we have made no mention of tertiary rocks, not that they do not occur, but want of time, and the state of the weather, has prevented us, as yet, from examining them. From what has been stated by some authors, they seem to occur in great abundance in the Sewalick, or Sub-Himmaleh range, from whence the splendid fossil organic remains lately discovered (which have excited such vast interest in the scientific world), have been obtained; with regard to these deposits, little satisfactory information has, as far as we know, yet been published. The fossil organic remains have received much attention from Falconer, Couleay, Baker, Colvin, and Prinsep, the last of whom, by his zeal, ability, and perseverance, has stirred up a spirit of inquiry, and given a stimulus to science in general, which before his time was unknown; his loss to India at the present moment is truly a national one. By several individuals splendid collections have been transmitted to Europe, among which we may mention those of Colvin and Macleod. In the Palæontology\* of this country, still, however, there remains a vast deal to be done.

At Bhar, the secondary rocks we meet with consist of sandstone, slate clay, and trap. As we proceed eastward to Bunnassur we meet with the same rocks, having a dip S. and by E. with an angle varying from  $15^{\circ}$  to  $50^{\circ}$ . The trap (green stone) abounds with iron, giving the rocks in many places a reddish brown colour. The same remark applies to the slate clay, which in many places is much decomposed. At the line of junction of the sandstone and slate clay with the trap, they are frequently found to be highly indurated; of this appearance we have many fine examples at Bunnassur. The sandstone, which is in general of a greyish white colour, abounds with mica, giving it in many places a slaty form; this variety is the micaceous sandstone of some authors. In the locality just mentioned, I found a large calamite in the sandstone, and in the slate clay at a short distance from it a fern and seed. The iron which occurs disseminated through the wackes is the red iron ore, or red hematite, in too small quantity however to be of any economical value. In proceeding

\* Since the above was written, we have seen the splendid collection of Capt. Baker at Dadoopoor. In it we saw several specimens which could not be referred to any of the animals already described, no doubt quite new species; one, of which however there was only a fragment, seemed to belong to a genus hitherto unnoticed, approaching in several characters to one of the genera established by Cuvier, probably forming one of the connecting links.



from Bhar towards the Fir-tree Bungalow, we meet with much trap (greenstone) breaking through in every direction, and altering the Neptunian secondary strata, rendering their examination rather intricate. In proceeding from Subathoo to the eastward, towards the village of Draw, we have a fine example of the coal formation presented; opposite to this village we meet with limestone dipping to the S.W. under an angle of about  $50^{\circ}$ . Resting upon it, there is a bed of slate clay, and upon it, another bed of limestone; proceeding towards the westward we meet with sandstone, and resting upon it limestone; succeeding it, slate clay and bituminous shale. At the village of Koli we again meet with limestone, and as we proceed, following the same route, passing the villages of Benti, Rugg, Gegutkun, Shulkiali to Boag, we meet with other ten similar alternations, (see Sec. II). The beds have all the same dip, the angle varying from  $25^{\circ}$  to  $56^{\circ}$ . At Draw there is a water-fall, which is precipitated over the limestone cliffs. The whole face of the cliffs here, and along the route just mentioned, having a height varying from about 150 to 200 feet, are more or less covered with calcareous sinter and tuffa, shewing, as these minerals are deposited from water, that water-falls must at one time have been general in this district. Resting upon the limestone at Draw, and in one or two other localities, we meet with an extraordinary alluvial conglomerate, composed of small angular fragments of limestone, slate clay, bituminous shale and sandstone, held together by calcareous matter deposited from the water; whether the calcareous matter is deposited by springs issuing from the limestone rock, we are unable to state, our examination being of such a cursory nature; it is however more than probable. To account for goitre, various theories have been proposed, and the one, viz., that it is owing to mineral matter (lime) contained in the water of which the inhabitants drink, has been adopted, and strongly advocated by many medical men in this country. According to this theory it ought to be very prevalent in this neighbourhood. That this explanation will account for the disease in many localities, is no doubt probable; but how are we to explain its occurrence, and that too, to a great extent in primitive districts, where the only rocks met with are gneiss, mica, slate, clay slate, and granite, and in all the springs in which no lime has been detected; moreover, in many districts in Britain and on the continent of Europe, composed entirely of limestone, and in whose springs lime abounds, goitre is unknown. We shall afterwards enter fully upon the subject, when we have examined among the Himmaleh districts, similar to the above, of which there are no doubt many. In

the meantime we beg to draw attention to the villages occurring between Boag and Draw, in order that it may be proved whether goitre is prevalent or not. In its characters, the limestone varies from compact to earthy, the latter caused by the action of the weather; its colour varies from greyish white to bluish black, and in many places we find large embedded masses of *stinkstone*, of a dark greyish brown colour, or rather we ought to say, that the limestone during its deposition, has, by the evolution of sulphurated hydrogen, been converted into this mineral; when broken, the foetid odour is strongly perceptible. For architectural purposes, and as a top dressing when burnt, to soils containing the salt of iron, or any acid matter, this limestone is admirably adapted. In this manner many of the soils in India might be much improved. In structure, the slate clay and bituminous shale vary much; in some places indurated, in others partly decomposed. Their colour also varies much; of the former the most prevalent colour is greyish black, of the latter, brownish black; sometimes the slate clay, owing to the abundance of iron, is of a reddish brown colour. At the village of Boriti the slate clay has an angle of  $70^{\circ}$ , and is much contorted; near to this there is a thin bed of slate embedded in the sandstone. In regard to the rocks of the coal formation here, and those of other localities already mentioned, we may state (as we have already done generally) that they present the same mineralogical characters as those rocks, occupying a similar position in Europe. The true position of the coal measures, which has frequently been given erroneously by authors in this country, is when the geological series is complete between the red conglomerate and mountain or carboniferous limestone; the former the *Rothibugende*\* of the Germans is frequently wanting; when this occurs, we have the magnesian limestone superimposed upon the coal measures. In a work lately published on Indian Geology, it has been stated, that the magnesian limestone occurs, alternating with the coal strata. As such a statement is very apt to lead to a serious error, we have been induced to notice it. The rocks which the author has found, are merely the limestone of the coal formation, impregnated with magnesia; and it is a fact, proved by a vast series of experiments, that when the coal or any other limestone comes in contact with trap, it generally receives a large dose of mag-

\* In England it is sometimes termed the Exeter red conglomerate. In Scotland it has never been met with.

nesia, sometimes as much as 35 or 40 per cent.\* Moreover in a practical point of view, it is of the greatest consequence to distinguish these two rocks, as coal never occurs associated with the magnesian limestone, properly so called. In the same work the author talks about the discovery of shell limestone in the coal formation; no doubt he discovered limestone with shells, which frequently abound in the coal limestone; the other term however is strictly applied to a rock which is much newer and of rare occurrence, which has not as yet been met with in England. Murchison, however, has stated, that he has found its equivalent on the European continent; it occupies a position between the red marl, and the new red sandstone. It is the Muchelkalk of the Germans. To distinguish therefore between these, and at the same time to apply their proper names, is of consequence, which can be easily done by examining the fossil proper to each; characteristic of the latter, we have *Enerinilis*, *Montiformis*, *Avicula*, *Socialis*, and *Ammonites*, *Nodasus*, &c., and of the former *Producta Serebralulae*, or the *Ceratitis*, &c.

There is another circumstance worthy of notice here, viz. *Red Sandstone*. It is not to be supposed that when sandstone is of a red colour, it must always belong either to the old or the new red sandstone, an erroneous idea which has led to many errors, and much censure by foreign geologists. To find red sandstone alternating with the white sandstone of the coal measures (a fact which ought to be recollected by individuals engaged in searching for coal in this country,) in Europe, is not unfrequent. In lower Silisia nearly the whole of the coal field is composed of reddish brown, and cochineal coloured sandstone, with which great beds of coal alternate.† In Scotland, in the Lothians, alternations of the red and white sandstone in the coal fields are frequently met with.‡ This rock (red sandstone) seems to occur in great abundance in this country; its relations, however, have not been properly investigated. In a report drawn up for the Coal Committee by Dr. McClelland, there is much interesting information in regard to it; of the rocks which enter into the composition of the coal formation, we have already mentioned as occurring among the Himmalehs sandstone, slate clay, bituminous shale, and limestone. To make the series complete, we want, fine

\* Edinburgh New Phil. Journal. Analysis of Limestone from the neighbourhood of Trap ——— Dumfriesshire, by William Copland, Esq. In the same Journal many similar analyses will be found.

† Notes to the Geology of Dumfriesshire, by Professor Jameson.

‡ Ibid. Locis Citatis and Cunningham's Essay on the Geol. of the ——— Trans. vol. VII

clay, clay ironstone, and coal, which consists of four kinds—pitch coal, slate coal, canal coal, and glance coal; the last however in the secondary series occurs in but small quantity, and is of no value. Resting immediately below the carboniferous or mountain limestone, we find among the Himmalehs a series of slates (the old red sandstone where we have as yet examined being wanting) the equivalent of Murchison's Silurian system, between which however there is no line of demarcation from the transition properly so called, viz. the grey wacke, grey wacke slate, clay slate, &c. having the same angle, dip, and direction. Shortly after leaving the Fir-tree Bungalow, we meet with the slates in general dipping to the N. E., under an angle of upwards of  $70^{\circ}$ . At Hurreepoor Bungalow we still meet with the same slates, alternating with quartz rock, and as we approach near to Syree, we meet with a series of alternations of grey wacke, grey wacke slate, clay slate, sandstone, and quartz rock. Syree village is built upon clay slate; on ascending the hill which overlooks Syree, we find the slate occurring nearly at right angles, with the usual dip to the N. E., produced by a large mass of quartz rock. In no part of the mountains which have as yet come under our observation, are the effects of the quartz rock on the grand scale more beautifully seen, than in this locality, nor could a finer example in order to study the effects, and at the same time the relations of the latter, be pointed out. On the south side of the village of Calug, which consists of a few native huts, the slate is highly inclined, and much contorted, and dips to the N under an angle of  $75^{\circ}$ . Before reaching the village of Badari, which consists of a small bazar, and about twenty or thirty native houses, we again meet with the quartz rock, stratified, and dipping to the N.W. under an angle of  $25^{\circ}$ . Immediately above the village mentioned, close to which a mountain torrent passes, we have a beautiful section of clay slate, upwards of two hundred feet, being exposed dipping to the N. and W. under an angle of  $25^{\circ}$ .

At the first resting place used by coolies coming from Simla, a small table-shaped hill, distant about two miles from it, there is an immense dyke of basaltic greenstone, cutting through the clay slate, which at the line of junction, and for some distance, is much indurated. Cutting through the basaltic greenstone we have small dykes of syenitic greenstone, we have therefore here three different ages of formation. From this place to Simla we meet with the same clay slate, in many places however highly crystalline and passing into mica slate. The numerous metamorphisms which the slate assumes around Simla, passing from the rather earthy looking slate

of the transition series, into the highly crystalline slate, which is composed almost entirely of mica, or into chlorite slate, mica slate, &c. renders, if the individual observations are confined to this place alone, the determination of the age of the strata in general, impossible. In fact, the whole of the rocks in the neighbourhood of Simla appear to be more or less altered, but all belonging to one grand group, viz. the transition. To make out this point, we must proceed northward from Simla towards Kotgur, where ample means will be found to settle it. The changes observed are quite similar to those exhibited by the grey wacke in the south of Scotland, when in contact with Plutonian rocks.\* In examining the neighbourhood of Simla, we were much assisted by Dr. Macleod, who being intimately acquainted with all the finest, most interesting, and best exposed sections, at once directed our attention to them, by means of which we were in a comparatively short time enabled to acquire a thorough knowledge of the district. To him we beg here to acknowledge our great obligations, and to return our grateful thanks.

The rocks met with in the neighbourhood of Simla, are,

- 1 Grey wacke,
- 2 Grey wacke slate.
- 3 Clay slate.
- 4 Chlorite slate,
- 5 Mica slate.
- 6 Quartz rock,
- 7 Syenite.

on both sides of Simla valley, whose direction proceeding downwards is at first nearly due east and west, it then takes a turn to the south west; there is clay slate; on its east and by north side we have the Jacko mountain, reaching to a height of 8,300 feet above the level of the sea. It is entirely composed of clay slate, in many places as near; and at the summit, we meet with large embedded dykes of quartz rock.† The ridge upon which the Simla bazar

\* Journ. on the Geology of the Ciffel Kirkbrau and the Needle's Eye in Galloway. Wern. Tran. vol. IV. Dr. Grierson on the mica of Galloway. Ibid. vol. II. and Hzy Cunningham, *locis citatis*.

† The Jacko is the highest mountain met with in the neighbourhood of Simla, it is considered to be about 800 feet above the Simla bazar. By experiments made conjointly with Dr. Macleod, with thermometers and boiling water, we ascertained that his house, situated at the foot of Jacko, was 7,800. By similar experiments we ascertained the height of Subathoo 4,480 (Mr. G. Clerk's house at Bunnassur 5,600); on all occasions we used rain water if it (or snow water which is the best) is not used, the result given is usually inaccurate, common spring water containing a quantity of foreign ingredients, it ought therefore never if possible, be had recourse to.

rests is also almost entirely composed of clay slate, dipping to the south east under an angle of  $25^{\circ}$ . In Section No. III. we have given a view of the strata extending from Dr. Macleod's house, at the foot of Jacko, immediately above the bazar, to Lord Auckland's Road.

The clay slate varies in colour from bluish black to ash grey, with the various intermediate tints. In structure, it varies from rather earthy to highly crystalline, and in its transitions we have it passing, as in Simla valley, into chlorite slate; in other places, as in the Auckland Road, into quartz rock, the latter of which frequently alternates with it, in thin layers, forming mica slate. In composition, as already stated, it frequently consists of nothing but mica. In the section of the Auckland Road, we meet with a large mass of slaty quartz rock, formed by thin layers of clay slate alternating with the quartz rock; in fact it is almost identically the same in mineralogical characters, as the rock met with in the Lockken district in Kirkcudbright, Scotland; from the first time we examined this section we were instantly struck with the identity, which a further examination fully verified, of the induration and alternation of the clay slate in junction with quartz rock; we have a beautiful example at the first water-fall below Simla. Here there are large masses of quartz, forming dykes of many yards in thickness in the clay slate, whose greyish white colour contrast finely with the dark bluish colour of the latter rock. The fall is a perpendicular height of about 140 feet, over which, during the rainy season, a very considerable body of water is precipitated, forming an interesting sight, well worthy of the attention of the traveller; with Dr. Macleod we also visited and examined the other water-fall, some distance below the one mentioned, and found the rocks, &c. to be similar. In tracing the strata in the bed of the river from it towards Simla, we meet with many junctions, and it is here we find the clay slate passing into chlorite slate. The rolled masses, or boulders, principally consist of quartz rock, syenite, clay slate, chlorite slate, &c. In a valley bearing north and by east from Anandale, there is a quarry of clay slate, which is used as a roofing material for many of the houses in Simla, the rouge, huge, thick and unshapely masses employed are quite in unison with the mineralogical operations carried on in other parts of India; in fact it is quite remarkable that the beams are able to support the enormous weight superimposed. We have already stated that no where in the immediate neighbourhood of Simla is grey wacke to be met with; but as we proceed northward towards Kotgur, about one and a half miles, we

meet with a series of alternations of grey wacke, grey wacke slate, and clay slate, having the same dip and direction as the slates just mentioned, proving that they must be of the same age, and that they were up-raised contemporaneously. How far this series extends towards the north we have not as yet ascertained; as far as we have gone, viz. upwards of four miles beyond Simla, we have still found it.\* Four miles to the south of Simla we have already noticed a similar series of alternations. In its characters, the *grey wacke* is characteristic, consisting of a basis of clay slate, with imbedded fragments of clay slate, quartz rock, flints, &c. The size of the embedded fragment varies from upwards of six inches, to so small as to be almost imperceptible to the naked eye, and forming gradually a transition from the grey wacke to the grey wacke slate, and from it into clay slate, in which no fragments exist. In No. V. we have given a section exhibiting the different alternations from the most northern point to which we have as yet gone to Simla. It is rather remarkable, that here, where we find the grey wacke unaltered, quartz rock occurs in but small quantity. The clay slate which alternates with the two rocks mentioned, is identical in its mineralogical characters with the clay slate of Simla, when not in junction with quartz rock.

Quartz rocks occur in three different forms; as imbedded masses in the slate, as dykes or veins, and in masses exhibiting the regular stratified form; the seams of stratification being as well marked as either those of clay slate, or grey wacke slate. In structure it is compact or granular, much more frequently the former. The colour is generally greyish white; sometimes, owing to the presence of iron, it is reddish brown, blood or brick red; in a few instances we have observed it of a rose red colour, void, however, of the fine translucency observed

\* Since the above was written we have in company with Dr. Macleod examined the country as far as Tagoo; the predominant rock is still the clay slate; near to Mabassoo we meet with two alternations of quartz rocks. In this route the clay slate is frequently formed contorted in a most extraordinary manner. The dip is generally north and west, the angle varying, in some places it was about 70°. The magnificence and grandeur of the view of the snowy range from Mabassoo can be better imagined than described, and the optical delusion is so great, as to make it appear not more than six or seven miles distant. In the foreground you have here and there thick wooded districts, whose dark shade contrasts beautifully with the bleak white, but majestic peaks, whose snow-clad summits tower into the heavens, and defy all human exertion to surmount. Here also you see well what we have already stated, though with some doubt, viz. the *parallelism of the subordinate mountain ranges and valleys*.

in the rose quartz\* met with in Bavaria, Saxony, &c. That the quartz rock owes its formation in many places to Plutonian action, is fully proved by the observations already made, and by many other sections not yet noticed. Probably the best to illustrate this, is to be met with on the road leading from the small church of Simla down to the river torrent. Here we have a large dyke of quartz rock, cutting through the slate, and altering it; superimposed there is a large mass of slate lying upon the outcrop of the dyke, unconformable to the other slate, and at the same time converted into a highly crystalline mass, which seems to have been torn off from the subjacent rock at the time when the quartz rock came from below (see section VI.); moreover to meet with large masses of slate imbedded in the quartz rock, is not an uncommon occurrence. In the Simla road, immediately above the cantonments of the Goorka battalion, there is a good example. The alteration, shifts, &c., met with in the clay slate when near the quartz rock (see section VII.), is also another proof of the existence of Plutonian action, and moreover we find it passing imperceptibly in the new road, or Auckland Road, into syenite. Here also imbedded in the quartz rock, we frequently meet with veins of quartz of a much whiter colour, pointing out in a striking manner the shifts which have taken place (see section VIII.) That however in other places it is Neptunian deposition, is evident from its regularly stratified form, and at the same time when in contact, not altering the clay slate.

The last rock we have to notice is *Syenite*. It occurs in only one locality, in the form of a large amorphous dyke, intersecting and altering the clay slate, it passes gradually into quartz rock. In structure it is small, granular, and is composed of quartz and hornblende, the former of a greyish white, the latter of a leek green colour. As we have not examined sufficiently minute the trap† mentioned, we shall take another opportunity of giving an account of them.

\* The rose quartz of mineralogists, owes its colour to manganese, and is much prized, when pure, as a precious stone; it is however very liable to fade, if much exposed to the air. Jam. Manus, Sect.

† At Rajmahal, where it is stated existed the capital of the Mahomedan power in Bengal, in the reign of Akbar, towards the end of the sixteenth century, we find among the ruins some fine examples exhibiting the polish, which some of the trap are capable of receiving. Thus, in the *Sungi Dulla*, or marble hall, erroneously so called, there are still existing some enormous slates of beautifully polished basaltic clinkstone, ornamenting the doorways, walls, &c. which by the ignorant have been considered black marble, and thus given rise to the erroneous name. In every work we have consulted, this term is used. It is also stated that the ruins principally consist of granite, a word too frequently used as a cloak for ignorance. What we principally saw were bricks and trap.



In regard to simple minerals met with imbedded in the rocks, our list is but small, consisting of

Calcareous Spar,  
 ——— Sinter,  
 ——— Tuffa,  
 ——— Quartz,  
 Dodecahedral Garnet.  
 Red and brown Hematite.

In addition to the localities mentioned of the iron ores, Dr. Macleod pointed out to us several masses in the bed of the river torrent in Simla valley, shewing probably, as the fragments were angular, that a vein, or veins, occur near, of little value, however, from their impurity. In regard to the garnets, it is rather a remarkable fact that we have only met with them in those localities where the clay slate appears to have been much altered; the same has been remarked in Europe by Sedgwick, and Lyell. As yet we have no account of the minerals met with among the Himmalehs; those already noticed amount to not more than twenty or thirty, a statement truly remarkable, pointing out how lamentably this department has been neglected; in such a mighty range we ought to meet with an immense number of minerals. In the collection of the Asiatic Society of Calcutta, we found several minerals which have never as yet been noticed as occurring in India; but whether these were found in this country, or imported, is a question, no labels being attached, and Mr. J. Prinsep in England. Calcareous spar occurs frequently in the form of veins in the clay slate. Of the other minerals mentioned, the localities have already been given.

Having now noticed, both generally and particularly, all the rocks and minerals which have as yet come under our observation, we shall make a few remarks in regard to that formation (the most important of all formations) which forms such large tracts of the Himmalehs; I allude to the coal formation. From what has been stated by authors, and from what we have already seen, it is not at all improbable that there is a belt composed of those rocks, extending along the whole base of the Himmalehs proper. The furthest point, to the westward of which we have notice of these rocks, is Attock, and to the eastward, probably Darjeling; comprehending about 17° of longitude; that, however, it extends further in both directions, is more than probable. That no bed of coal worth working has

\* Near Subathoo imbedded in the slate, sulphate of lime or gypsum is found. From this rock the celebrated Plaster of Paris is made.

been met with in such a vast tract of country, results not from its absence, but, probably, from the partial manner in which the country has been examined. Captain Herbert in one of the vols. of the Asiatic Society's Trans. has given a paper on the occurrence of coal in the Indo-Gangetic mountains, in which he comes to the conclusion, that all the sandstones and other rocks noticed, belong to the red wacke series, but from data utterly groundless; and remarks in regard to the probability of finding the coal formation, that the indications are unfavourable; we shall however quote his own words—"it will be perhaps asked," he says, "is this coal, of which the traces are probably widely diffused in our sandstone range, likely to prove of any value, or do these many indications afford any ground to hope for the discovery of more extensive and profitable deposits?" To this it may be replied, that the considerations upon which are founded the hope of discovering, in the neighbourhood of these mountains, the true coal formations, are quite independent of its occurrence under this type and in this form; if any thing perhaps, they are rather unfavourable to the expectation of eventually discovering beds of the true coal formation, for it has been noticed, that in those countries in which the coal beds are most largely developed, as in England, the traces of the mineral in the superincumbent sandstone are rare, if not altogether wanting; while on the continent, where the true coal beds do not occur, small seams or veins are frequently met with in this rock. To find traces of coal in superincumbent sandstone, in districts where coal has not been found, is one of the strongest evidences, if not the most important, that coal is present. In fact nothing is more common in a coal district, than to see disseminated through the sandstone, or occurring in small seams, coal prior to reaching an important bed; we may state that from it we are entitled to infer, that if a shaft is sunk sooner or later, we shall arrive at the bed of coal. In examining a coal district, advantage should be taken of all the streams that occur in a district, for by so doing, a transverse section of the strata is obtained, and frequently thus the outcrop of a bed of coal is perceived. It is also of importance to examine the masses which occur in the stream, coal in such localities, frequently occurring at a considerable distance from the bed in situ. If the remarks of Captain Herbert were applicable, all the observations made by geologists, mining engineers, &c., would be void. In the same paper we are told, that grey wacke is considered as synonymous with the old red sandstone by most geologists; who these geologists are he alludes to, we do not know. Also that at Delhi

and other plates there is a primary sandstone ; we take notice of these statements, in order to shew that Captain Herbert made the above statements prematurely. It is impossible for any individual at all acquainted with the mineralogical characters of rocks, and the relative position which they occupy in the crust of the earth, to attempt to prove that in one continent rocks with identically the same characters and fossils, are different from those in another. To find slate clay, bituminous shale, limestone, and sandstone, as the equivalent of the red marl, upon the evidences he has given, is more than premature, originating however, in all probability, from the description of the rocks in the Punjaub, which (probably without a proper examination) have been considered as the continuation of those to the eastward. It has been stated no doubt that no bituminous shale occurs, but we have shewn that it, as well as limestone, occurs in great abundance, the former of which rendering the probability of the existence of coal in quantity, more probable. That the equivalent of the red marl may be found, and that too in some of the districts mentioned by Herbert, is possible ; and if such should turn out to be the case, it is well worthy of examination, seeing that it is in this formation, the great beds of rock, salt, and gypsum, or sulphate of lime are found.

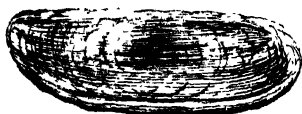
To discover coal in quantity in the neighbourhood of the Sutledge, or any place where there is easy access of carriage in that direction, would no doubt, in a short time, be of incalculable benefit to the country at large. In a short time the Indus will become an immense resort for trade, and we may expect it soon to be covered by all kinds of vessels ; but those to which the European looks forward, whose power and rapidity of motion have so approximated Europe, will ever take the lead ; and until stream vessels are impelled by some other moving power, coal will ever be considered as one of the greatest benefits conferred on mankind ; moreover in connexion with the coal we may expect to find clay iron-stone, which will also prove of the utmost consequence. It is from this ore that three-fourths of the iron is obtained in England. It has been met with at Darjeling, and several other places in India, but from the want of fuel and flax to reduce it, we do not think it has ever been made use of. If however we look at the mineral resources of this country, what are they at the present moment ? nothing to what they ought ; a spirit of inquiry is now happily gaining ground ; sanctioned by Government a coal committee has been appointed. To its proceedings therefore we look forward



### Wooden Tray

*from 2 feet to 8 inches long*

*1/2 inch thick*



### Wooden Bucket

*7 or 8 inches diam.*



### Wooden Trough

*3 or 4 feet long 1 foot or 18 inches wide*



with interest, and hope soon to see through its exertions, a spirit of inquiry stirred up throughout India.

(Signed,)

W. JAMESON.

AMBALLA,

13th October, 1839.

ART. V.—*Note on the process of washing for the Gold Dust and Diamonds at Heera Khoond.* By Major J. R. OUSELEY.

The day before yesterday, I visited the Heera Khoond, and saw the process of washing for gold dust and diamonds. A set of fishermen have villages free from rent; on this service, men, women, and children are employed. The women alone wash, the men and children bring the gravel and sand in wooden trays, and place it in the trough, which is open at one end, with a gentle inclination towards the river, on the edge of which the women sit. With their left hands they stir up the gravel, and with the right pour water out of a wooden basket-looking bucket gently over the upper end; it runs out into the river, the larger pebbles and gravel are thrown over, and the finer sand, on the trough being full, re-washed until little remains, when it is removed into the wooden trays, and by dipping them under water, and shaking them about, the gravel gradually falls over, leaving only gold dust. They detect the diamonds at a glance, as they wash. One I saw about the size of a large grain of wheat, clear and bright; but these are not to be purchased, as they are the Raja's property. The gold they are allowed to dispose of; which they do at 12 or 15 rupees per tola. The veins are, I am convinced, some distance off, as the grains of gold appear flattened by collision, in rolling among pebbles. I have the pleasure to send 3 mashas, ( $\frac{1}{2}$  a tola not yet brought), and some of the rocks about the spot where the diamonds and gold dust are found. The *Heera Khoond* is an island, about a coss long, and one or two hundred yards wide in the Mahanuddy, seven miles, seven and a half furlongs from the eastern end of Sumbulpoor. The *Heera Khoond*, is that part of the river, which runs south of the islands. The diamonds and gold dust are said to be washed down the *Ebee* river, about four miles above the *Heera Khoond*; but as both are procurable as far as Soonpoor, I am inclined to think there may be veins of gold along the Mahanuddy. It would however, I think, be very desirable to have this part of the country properly examined, which it never was yet. Gold washings might be under-

taken on mechanical principles, which would, by reducing the manual labour, make the speculation highly profitable in gold dust alone, setting aside the diamonds.

The season for washing is after the river subsides, on the rains ceasing ; but they occasionally continue until the rains again interrupt their labours. I have *fancied* that a graduated wire-sieve washing machine might be made, larger at the top, and smaller as the sieves approach the bottom, which would in the passage of the debris, flung in at the top one, to the bottom (a wooden tray) keep the more minute particles in suspension, or permit of the sieves retaining in succession the pebbles of gravelly matter ; all earthy particles being carried away, if the machine were placed in a gentle stream, the gold dust would be found in the tray. Each sieve should be carefully examined for diamonds, on the machine being full ; the machine might be six feet long, two wide, and six or eight high. The sieves being a foot or 18 inches apart, it would be necessary only to take up the top and second sieves often, the lower ones would take longer to fill ; the machine should be made so as to admit of its being shaken constantly, and hung up in water six or seven feet deep, where the current would be gentle.

J. R. OUSELEY.

*Camp, Sumbulpoor,*

*Feb. 14th, 1840.*

P.S.—There is also gold dust, in the Brahminee river, about six marches east of this, but no diamonds.

The women sit along the edge of the river, facing inwards, and gradually form little mountains of pebbles. The number employed is very great, but the speculation is not very profitable now.

# ART. VI.—*Proceedings of the Asiatic Society.*

(*Wednesday Evening, the 4th March, 1840.*)

The Honorable Sir E. RYAN, President, in the chair.

The Proceedings of the last Meeting were read.

Messrs. James COLQUHOUN, H. SWEETENHAM, C. K. ROBISON, T. C. CADOGAN, and R. H. MATHEWS, proposed at the last Meeting, were balloted for and duly elected Members of the Society.

M. RENAUD proposed at the last Meeting, was upon the favourable report of the Committee of Papers elected an honorary Member of the Society.

The Rev. A. W. STREET proposed by Dr. O'SHAUGHNESSY, seconded by Mr. SUTHERLAND.

Rajah KISHNA NATH ROY proposed by Mr. SUTHERLAND, seconded by Dr. O'SHAUGHNESSY.

Read letters from Messrs. A. PORTEUS and W. A. GREEN, withdrawing themselves from the Society.

Read a letter from Messrs. W. H. ALLEN and Co. intimating their having forwarded the busts of Sir Wm. JONES and Mr. COLBROOKE, per ship "Felicity." (The busts arrived on the 20th April in perfect safety.)

Read a letter from James REYNOLDS, Esq., Secretary to the Oriental Translation Fund of the Royal Asiatic Society, stating that arrears of the Society's subscriptions were due to the amount of 42*l.*, from 1836 to 1839 inclusive.

The Secretary informed the Meeting that the Society's Book Agents in London have been instructed to discharge the claim in question.

## *Library.*

The following books were presented.—

The East Indian Journal of Literature, Science, and the Fine Arts, No. 1, by R. C. WOODS, Esq. L.L.D.—*by the Author.*

Esquisse Generale de l'Afrique by Mr M. D' AVERGAC, —*by the Author* through R. C. WOODS, Esq., L.L.D.

Proceedings of the Bombay Geographical Society, May, 1839, —*by the Society*

Proceedings of the Astronomical Society, vol. 4, No. 24, —*by the Society.*

English and Chinese Vocabulary, by R. MORRISON, D.D. —*by Messrs. Thacker & Co.*

A brief account of the Chronometer, with remarks on those furnished by PARKINSON and FRODSHAM to the expeditions of Capts. ROSS, PARRY, SABINE, KING, LYON, FOSTER, and other distinguished navigators —*by Mr. Frodsham.*

Madras Journal, Nos. 21, 22, 23 and 24 —*by the Madras Library and Auxiliary Royal Asiatic Society.*

The following was received from the Booksellers:—

Lardner's Cabinet Cyclopædia, Biography, Literary and Scientific men, vol. 2.

## *Literary and Physical.*

Major J. R. OUSELEY forwarded a short notice of the process of washing for the gold dust and diamonds at Heera Khoond, with specimens of the gold dust.



Read a letter from Capt. T. L. BYRT, forwarding copy of a facsimile taken by him at Paijore.

Read a letter from Major T. JERVIS, (Engineers) forwarding a paper on the cotton at Gujerat, by Mr. VAUPELL.

Read a letter from R. C. WOODS, Esq. forwarding a paper on the Introduction to the study of the science of Ethnology, or the Natural History of the human race.

Read a letter from Dr. N. WALLICH, forwarding for presentation on behalf of Mr. PARKER a specimen of the timber of the "Royal George," blown up in Colonel PASLEY's operations.

Various specimens of minerals were presented by Major J. R. OUSELEY.

A sword fish and a hammer-headed shark, were presented by E. D. FABIAN, Esq.

An alligator, presented by Mr. R. S. HOMFRAY.

#### *Museum.*

Pursuant to the resolutions of the last Meeting, the Secretary then laid before the Meeting the rules framed by the Committee of Papers, regarding the office of Curator of the Museum.

At a Meeting of the Asiatic Society of Bengal, held on the 5th February,

1840, it was proposed by Sir E. RYAN, seconded by H. T. PRINSEP, Esq. and unanimously agreed,

That the office of Curator to the Society's Museum be held in future on the following conditions—1st. Two hours at least to be devoted daily to the duties of the Museum. 2nd. Monthly reports to be made to the Committee of Papers. 3rd. The objects of Natural History belonging to the Society's collection not to be removed from the Museum. It was further decided, that the Committee of Papers should report to the next Meeting, on the nature and extent of the duties the Curator is to undertake, with reference to the office as held in other Museums.

#### *Report of the Committee of Papers.*

The Museum of the Asiatic Society of Bengal may be considered to embrace two very distinct departments. 1st. That of Oriental Antiquities, Literature, Architecture, and Numismatics. 2nd. That of Natural History.

It would be of great importance to secure, were it possible, the services of a Curator conversant with both these divisions; but such a combination of acquirements is so rare, that the Society must trust the arrangement, elucidation, and preservation of the articles appertaining to the first division, to the honorary services of the Oriental Secretary, the Librarian, and Pundits.

In the department of Natural History, it must be borne in mind, that the Curator's great object should be, to arrange and extend the Society's collections so as to make these available for the information of the student, conducive to the general illustration and advancement of science, and worthy of the place the Society holds among learned institutions. Viewed in this light, it is of far more importance to the Society that their Curator should assiduously apply himself to the collection, naming, and arrangement, of procurable specimens of the animal and mineral kingdoms, than that he should specially devote himself to the minute elucidation of any sub-division of these subjects

By the elaborate investigation of a group or family, he may doubtless distinguish himself, and gain high individual reputation, but his utility to the Society would be far greater, by his applying himself to the humbler duties we have specified; moreover, it appears to us that these duties are in themselves more than sufficient to occupy the Curator's time, were it even to be entirely devoted to their discharge.

Our collection of minerals is an utter chaos, though rich in anonymous specimens, —valuable in themselves as illustrations of abstract mineralogy, but devoid of interest in a geological or geographical light, owing to the neglect with which they have been treated by some preceding Curators. It appears to the Committee of Papers, that the first object of the Society, in remodelling its Museum, should be, to form a grand collection of minerals and fossils, illustrative of the geology, geography, and palæontology of our British Indian possessions.

A few of the existing minerals, and some superb fossils in our Museum are available for this object, but it is clearly within the scope of the Society's influence to procure, within a few months, collections of specimens from every part of India, and in such numbers as would find the Curator in ample employment. While waiting for these additions to our collections, he should proceed to name and label those already in our possession. There is no need for delay for the preparation of cabinets. The specimens should be named, labelled, wrapped in paper with a number affixed, and then packed in boxes, until the cabinets are ready.

Duplicates of all specimens should be preserved for verification and analysis. Triplicates should be retained, wherever practicable, for presentation to other Museums in exchange.

The monthly reports should be a statement of progress in this duty, and affording a catalogue of the minerals adjusted. The specimens themselves should be exhibited at each Meeting.

This duty the Committee think should supersede all others for the first few months of the Curator's employment, meanwhile his subordinates would conduct the arrangement of such specimens of the animal kingdom, as might require immediate attention.

All correspondence connected with the Museum should pass through the Secretary's Office, in conformity with the practice of similar institutions. It seems to the Committee of Papers an anomalous and inexpedient practice to commit the whole management of exchanges and similar transactions to the Curator. The suggestions of that officer will be always received with due attention and respect by the Committee; but it is manifest that without their being referred to it, the Committee cannot be responsible for the expenditure which the Curator's measures and correspondence may entail, for the views on which he may act in the management of the Museum, nor for the light in which this department of the Society's labours may be regarded by scientific men, and institutions in other countries.

It seems necessary too, to stipulate that all memoirs or papers drawn up by the Curator for publication, as well as plates, models, &c., on subjects he may have investigated *on discharge of his duties*, should be in the first instance placed at the disposal of the Committee of Papers, also that all proofs of such papers pass through the inspection of the same body.

The Committee are led to this suggestion by the circumstance of a fly-leaf having been prefixed, without their sanction or knowledge, to the last volume of the Transactions. Although containing nothing from which the Committee would dissent, the

precedent is one which they are desirous of avoiding, as it obviously may lead to many objectionable results.

The Committee deem it highly desirable to secure, if possible, Dr. M'Clelland's valuable services on the terms they have now set forth. His acquirements in various departments of Natural History, his zeal for the promotion of science, the liberality and disinterestedness he has evinced in his past connexion with the Museum, entitle him to be preferred to most competitors for this appointment. The Committee have endeavoured in this report however to discuss without bias towards any individual, the stipulations for tenure of office, which they deem most conducive to the interests of the Society and of science, and most likely to receive the approbation of the Government, through whose liberal grant the occasion of this discussion has arisen.

In the event, however, of Dr. M'Clelland's declining to accept the situation on the terms now proposed, the Committee recommend that candidates be invited to present themselves, that the testimonials of such candidates be examined and reported on by the Committee of Papers, and finally considered at a General Meeting. That the individual selected be appointed, but for twelve months, and his permanent appointment be made dependent on the ability and industry evinced during the probationary period.

Should no candidate of sufficient acquirements present himself within three months, the Committee recommend that the President be requested to communicate with the proper scientific authorities in Europe, authorizing the appointment and dispatch to India of a competent individual, bound to serve the Society for a period of five years, and subject to the rules herein expressed.

The Committee would not be disposed to extend to any other individual but Dr. M'Clelland, the privilege of devoting but two hours daily to the Museum, and would require four hours at least, actual attendance at the Museum, from whatever other candidate might be selected.

EDWARD RYAN, *Kt. Chief Justice of Bengal, & President of the Society.*

H. T. PRINSEP, *Member of Supreme Council, and Vice President*

W. P. GRANT, *Civil Service.*

H. TORENS, *Civil Service.*

J. C. C. SUTHERLAND,

W. B. O'SHAUGHNESSY, } *Acting Secretaries, &c.*

D. McLEOD, *Colonel of Engineers, and Vice-President*

D. STEWART, *Superintendent General of Vaccine.*

DAVID HARE, *Commissioner of Court of Requests.*

H. W. SETON, *Kt. Puisne Judge, &c.*

W. H. FORBES, *Major of Engineers, and Mint Master*

N. WALLICH, *M.D. Superintendent of H. C. Botanic Garden*

*Minute by Dr. GRANT, Apothecary to the Honorable Company.*

I regret that I cannot concur in the whole of this report. Agreeing with much of the general principle that pervades it, I dissent from its application to our peculiar circumstances. The report closes with a well merited expression of the desirableness of securing, if possible, the services of a zealous, able, industrious and disinterested naturalist upon the spot, and yet purposes to fetter him with rules, which I fear might damp his ardour and circumscribe his usefulness, without any commensurate benefit to the institution, or perhaps alienate him altogether from a situation which he is well qualified to adorn.

The report proposes the consideration of the subject entirely on abstract principles, without reference to individual fitness here, or convenience of availing ourselves of such at once; but sincerely believing, as I do, that the readiest practicable plan is to avail ourselves of the intellectual means at hand, rather than incur the delay of waiting for remote and uncertain materials, I am averse to the adoption of rules which I fear may deprive us of Dr. M'CLELLAND'S services.

The three suggestions contained in the opening paragraph of the report appear to me objectionable, for the reasons to be stated as I proceed. 1st I would not tie down Dr. M'CLELLAND (supposing him ready to undertake the office of Curator) to two hours daily in the Museum. Though it is not unlikely that at an average Dr. M'CLELLAND would devote so much time to the duties of the Museum,—yet I conceive that the precise locality of duties bearing in the Museum, is of less importance than their being essentially well produced and looked after, not merely in the Museum, but out of it; since Dr. M'CLELLAND might labour very usefully for the Museum in his own house, without a scrupulous and inconvenient measuring of time within the walls of the Museum; and if left to himself might occasionally extend to more even than two hours. 2nd. Monthly reports for some time to come would almost entirely be confined to mechanical arrangement. Quarterly or half yearly reports, I conceive, would answer every useful purpose, and give less trouble. Let the Committee of Papers be a Committee of Management, and by frequent visits to the Museum obviate any tendency to inaction on the part of the Curator. 3rd. The non-removal under any circumstances of articles from the Museum, would impose a tantalizing restriction. A Museum, especially in India, is not the most favourable place for making minute observations, or recording results and circumstances. There may be several articles that the Curator would like occasionally to carry home, to examine quietly in the privacy of his own study; and I should be sorry to cramp any Curator's convenience by depriving him of this indulgence. To insist upon it, would be like the rule that holds in some libraries, that books should be looked at, only on the premises. That rule may be a very proper one in Europe, but I do not think it at present applicable here. Apply the same rule to numismatology, and it would be found very prejudicial. Had it been strictly acted upon in that branch, I question whether Dr. WILSON and Mr. J. PRINSEP (the latter especially) would have effected such splendid results. Neither would I pay our Curator the bad compliment of implying, by such a restriction, that he would not take proper care of specimens. Instead of this, I would permit him to carry away what specimens he required, for a reasonable time; the vacant space being occupied with a card or half sheet of paper, bearing the number and character of the article, and the date at which it was borrowed, with the words, "taken by Curator."

Quite concurring in that part of the report, which states that the Curator's great object should be generalisation of several subjects, and not special devotion to minute observation of a sub-division, yet as I conceive that the two objects are perfectly reconcilable, I have no doubt that Dr. M'CLELLAND would pay due attention to both; neither do I imagine that the claims of speedy and effectual mechanical arrangement would at all suffer in the hands of Dr. M'CLELLAND, or take up so much time, as the proposal to tie down that gentleman's passing two hours daily in the Museum, would seem to indicate. In conclusion, as far preferable to the plan of sending in three months to Europe for a Curator, and procuring one who after his arrival in India would very likely become discontented at finding himself tied down for five years upon a salary which may sound imposing in Europe, but would be only a pittance for a man of education in India, and scarcely upon a par with the pay of some mechanics, I would prefer closing for a twelvemonth with Dr. M'CLELLAND, or with any other qualified gentleman in India, to whom such a limited salary might be an object—should the conditions of offering the situation to the former be such as to make him decline it.

J. GRANT.

Calcutta, 15th Feb 1840.

TO J. C. C. SUTHERLAND, ESQ. AND DR. O'SHAUGHNESSY.

*Officiating Secretaries of the Asiatic Society.*

GENTLEMEN,—I was favoured on the 19th with your letter of the 17th inst enclosing a copy of a report of the Committee of Papers as to the manner in which the duties of the office of Curator to the Asiatic Society's Museum are in future to be conducted, and calling upon me rather prematurely to decide as to whether I can accept the office under such circumstances or not.

It appears to me that before my decision could be of any avail, the rules proposed by the Committee should be passed into law, and authorised by competent authorities. For my own part, I conceive the rules to be altogether vexatious, and so little calculated to promote the interests of the Museum, that I feel assured they will never be sanctioned.

2. In the next place, when the funds of the Society were inadequate to defray the expense of the usual salary, the Museum was just as valuable as it is now, and yet the duties were entirely left to me without restriction; but no sooner was the grant of an adequate allowance made by the liberality of the Government, than all became Curators; and I was supposed to be no longer competent to hold the office except under stipulations quite unheard of, in similar cases.

3. In vain did I even agree to the required stipulations in the sense in which those who proposed them, explained at the last Meeting of the Society that they were intended to apply, for as one scruple was removed, a new one was suggested,\* as if either to

\* Although I am the only officer of the Society who has but one other office to attend to, yet one of the first obstacles suggested was, that I had not time enough to devote to the duties, and although the officer who suggested this holds four or five appointments and is still a candidate for as many more, as he can secure, he has time enough without to know more of my business than I know myself.† (*Dr. M'Clelland's note*)

† Dr. M'Clelland forgets that he holds, or did then hold, three offices. Namely, Deputy Apothecary; Assistant Opium Examiner, and Secretary to the Coal and Iron Committee—all salaried appointments,—a short time before this discussion he was salaried Curator to the Museum also, to which he had no objection to be re-appointed. The first of the appointments above mentioned requires actual attendance at office from eleven to four daily.—Eps.

drive me out of office, or reduce the situation to a state of dependence quite incompatible with the responsibility attached to it.

It is also to be recollected, that the very first intimation I had of the liberality of the Government, in granting an allowance for the situation I held, was accompanied with a proposition to provide another in my place.

4. As the report proposes to have framed the duties of the office to which such new pecuniary interest is attached, on the established usage of other Museums, I must be permitted to point out the error into which the *Rapporteur* seems to have fallen.

5. The Museum of the Royal College of Surgeons in London is placed under a Board of Curators, over which the Members of the College have no authority. I allude to this Museum as one in which the Government have an interest, and in all other Museums to the support of which the Government contribute, the Curators are equally independent. This Board may not only cut and dissect the specimens in such manner as may be deemed essential, but may send them to lapidaries and others to do the same; and Mr. Clift as well as Mr. Owen may make use of the results, the same as if they had been derived from their own private specimens.

6. The Museum at the India House is placed entirely, I believe, in the hands of its keeper, who may not only make such use of his descriptions of the objects contained in it as he conceives most likely to promote the ends of science, but exhibit those objects when necessary to the Societies of the metropolis.

7. Can the Committee of Papers reconcile this, with the stipulations they require from their Curator? e. g. "that all *memoirs* or *papers*\* drawn up by the Curator for publication, as well as plates, models, &c. on subjects he may have investigated in the discharge of his duties, should, in the first instance, be placed at the disposal of the Committee of Papers; also, that all proofs of such papers pass through the inspection of the same body." The reason assigned for this very modest stipulation is perfectly ludicrous, and shows how unfit the Committee is to legislate in such matters, namely, that of a "*fly-leaf*" having been prefixed without their knowledge or sanction to the last volume of Transactions. Although containing nothing from which the Committee would dissent, the precedent is one they are desirous of avoiding."

8. The Committee of Papers should surely have been aware that it is the Secretary, and not the Curator, who must be held answerable for irregularities of this kind, and yet the odd remedy they would apply is, that of depriving the Curator of the literary<sup>o</sup> property that every one has a right to enjoy in his own free labours. How that could keep "*fly leaves*" out of the Transactions, I am quite at a loss to know.†

9. As the Committee do not profess to think much of "the elaborate investigation of a group or family," we cannot be surprised that they should not be disposed to encourage such a waste of time; and hence the clause preventing the removal of objects of Natu-

\* The only literary work a Curator is expected to perform in the execution of his duty is the preparation of a catalogue of the collection under his charge. Whether that be a *memoir* or a *paper* I must leave to the legal learning of those who would draw the distinction. Even with regard to a catalogue, I would advise the Committee to imitate the Council of the Zoological Society of London, and declare, that they do not "hold themselves responsible for the nomenclature, and opinions expressed in this publication," i. e. the catalogue. (Dr. McClelland's note.)

† The proof of the very unusual "*fly leaf*" alluded to, and which contained a glowing panegyric on the Bishop's College printing Press, was never sent to the Secretaries for inspection.—ED.

ral History from the Museum. Why, it was only at the last meeting of the British Association, that Dr. Buckland announced the intention of Messrs. Hutton and Henslow to continue the fossil flora of Great Britain, and of their requiring "the loan of specimens from the Geological Society, which would be carefully returned after drawings had been made of them."

10. Again, the Committee require that all correspondence connected with the Museum should pass through the Secretaries office, "in conformity with the practice of all similar institutions." Here the Committee no doubt evince the same intimate knowledge of the practice of other institutions, as in the instances already referred to.

It does not appear to have occurred to the Committee, that the Curator being a naturalist, can have little correspondence not connected with the Museum, so that to comply with this rule, he should require his friends to address him through the Secretary.

11. The Committee say, "our collection of minerals is an utter chaos," a statement which is not the fact, for they are all arranged; a Committee that would lay down rules for the direction of a Curator ought to know the difference between minerals and rocks. "Though rich," say this Committee, in "*anonymous* specimens valuable in themselves as illustrations of *abstract* mineralogy, but devoid of interest in a geological or geographical light, owing to the neglect with which they have been treated, &c." We can easily understand that the Committee may have been ignorant of the names of many minerals in the collection, especially as they do not seem to know the difference between minerals and rocks, but it does not follow that such minerals are "*anonymous*," in fact the use of the term, as the Committee have applied it, evinces a total want of information on the subject; a mineral is not *anonymous* because it is without a label, any more than a man would be so when without a card in his pocket, with his name written on it. A person acquainted with either minerals or men will always know them whether labelled or not.\* Yet this is the Committee who are ready to take the management of the Museum into their own hands, and as they say themselves, examine the claims of such candidates as may offer for the Curatorship within a period of three months.

12. "It appears," they say, "that the first object of the Society in remodelling the Museum, should be to form a grand collection of minerals and fossils, illustrative of the geology, geography, and palæontology of our British Indian possessions." This sounds well, but we are at a loss to know how *minerals* and *fossils* could illustrate *geography*, and had always supposed that palæontology was merely a branch of geology; but perhaps the Committee intend to remodel the Sciences as well as the Museum. "A few *existing* minerals" (could there be any other kind)? This is the report of a Committee of Papers of a learned Society, claiming an authority quite unprecedented over the labours of others, it is therefore of importance before their claims be sanctioned, to see how far the scientific character of the Society would be safe in their hands) "and some superb fossils in our Museum are available for this

\* This passage is quite explanatory of the views on which the writer acts, and of those by which the Committee of Papers are led.—As Dr. McClelland knows every mineral a glance, he thinks that quite sufficient. The Committee desire the novice to be supplied with the means of acquiring a little of their Curator's knowledge. As to the quibble regarding rocks and minerals, if Dr. McClelland knew the difference between a class and an order, he would be aware that every rock is a mineral, though every mineral is not a rock.—EDS.

object," i. e. for making a grand collection, but as the things in question are already in the Museum, they are not merely "*available*" for the object in view, but constitute so much of the object itself already accomplished.

13. The Committee continue, "while waiting for these additions to our collection, he," the Curator, "should proceed to label these already in our possession." It is within the recollection of the Society, that I stated eight months ago, that I could do nothing with the geological collection until cabinets were first provided: these were accordingly sanctioned by the Society, but ordered by the Secretary from a native for less than he could afford to provide them for, the consequence is, that they still remain unfinished.\* This is an instance of the ill effects of leaving the Curator dependant on the Secretary, or any one else, for things on which his own work depends; and as the circumstance is brought forward rather unfairly in the report of the Committee, I must be permitted to say, that had any member of that body required an *easy chair*, we may presume he would have obtained it at once, from the best cabinet maker, cost what it might.

14. There is but one name attached to the report which can be at all held responsible in a scientific point of view for the sentiments embodied in it, and although Dr. WALLICH may fairly be exonerated as any great authority on the subject of Museums, yet his own experience ought to have suggested the difficulty of making monthly reports on subjects connected with Natural History, he himself finding a single report too much to accomplish in the five years, that have now elapsed since his return from Assam.

15. From what has taken place on this subject, I have been induced to refer to the rules of various Societies and Museums, in hopes of finding some rules laid down for the duties of Curators. You will doubtless be very much surprised to learn, that though in all cases the duties of Presidents, Vice-Presidents, and Secretaries are strictly laid down in bye-laws, yet Curators alone appear to be the only officers who are left altogether to conduct their duties according to the best of their judgment and acquirements. Were they not the chief authority in all things on which the advancement, arrangement, and preservation of collections of Natural History depend, how could they be held responsible for their charge?

16. The antiquities may be safely left, as far as their "*preservation*" is concerned, to the "honorary services of the oriental secretary, the librarian, and pundits," but the natural history and geological departments must be left to a naturalist and geologist, for whose services the Society can have no security beyond his own reputation. Nothing could show the necessity of this more than the present attempt to reduce the Curator from that honorable and independent station which he fills in civilized countries, to a state of dependence on the caprice of Committees.

I have the honor to be,

Gentlemen,

Your most obedient servant,

J. M'CLELLAND.

28th Feb. 1840

\* Here Dr. M'Clelland is in ignorance of the facts, and consequently makes erroneous statements.—Eds.



The reading of Dr. McClelland's letter occasioned much amusement, and called forth some very pointed remarks from the President, Sir Edward Ryan; the Honorable Messrs. H. T. Prinsep and Wilberforce Bigg; Mr. Torrens, and others. Messrs. Curnin and Bagshaw suggested that the consideration of the Report be postponed to the next Meeting, but both these gentlemen at the same time disclaimed any defence of the terms and tone of Dr. McClelland's letter.

It was then moved by Mr. Bird, seconded by Mr. Piddington, and carried with but *two* dissentient voices, that the report be adopted, and that the Committee of Papers be empowered to act on the views it contains.\*

\* We are in possession of accurate reports of the observations made by the speakers on this occasion. We refrain from their insertion from motives which, in all probability, will be thoroughly mistaken by Dr. McClelland and his friends.—EDS.





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